ARCHIVES OF OTOLOGY.

OPERATION FOR THE RELIEF OF DEAFNESS, NOISES IN THE HEAD AND EARS, AND VERTIGO, DUE TO CHRONIC CATARRH OF THE DRUM OF THE EAR.

By SAMUEL SEXTON, M.D.

HAVING been requested to report some of the cases of catarrhal disease of the mucous membrane lining the drum of the ear in which the more serious symptoms arising therefrom have been cured, or relieved very much, by an operation, I have selected for this purpose several unpublished cases that are well known to the profession, with the hope that they will be found of interest to the otologist and others whose advice may be sought for the treatment of the distressing symptoms of this form of ear disease.

CASE 1.—Mrs. A., age forty-six, New York, came to consult me over two years ago with a most distressing history. For ten years she had gradually been getting more and more deaf, specially in the left ear. About one year ago she became decidedly more deaf in the right ear. Having now been over six years under special treatment, and constantly getting worse, she was greatly discouraged. The noises and beating in the head and ears had, indeed, become unbearable; in the left ear it was like the confused din of a machine-shop. This severe form of tinnitus having existed for many months, and having been led to believe that her case was hopeless, she felt that if no relief was obtained she would lose her mind. It was in this state that, after consulting her family physician, Dr. J. D. Bryant, about the matter, she came to the writer to avail herself of the benefit of an operation on one or both ears. On examination the following conditions were found to exist:

Hearing: The tuning-fork on teeth not heard in the ears, but sounds like a bell in the head. Plain, ordinary voice could be heard about three feet only in either ear when short familiar sentences were used, but general conversation, with more than one person, was impossible. Owing to the deafness and noises in her head and ears only a most unbearable and confused tumult of noises could be heard at theatrical or musical entertainments.

She heard best in noisy vehicles, railway-cars, and the like.

The drumheads were lustreless; the left was retracted and somewhat irregular, the latter condition, perhaps, a result of otitis media in infancy. Both drums were affected by chronic catarrhal inflammation.

I removed the drumhead and malleus from the left ear, March 25, 1889. The incus and stapes lay beyond the range of vision, and were left. Soon after regaining consciousness she heard a clock striking, which had been inaudible to her for a long time.

On the fifth day patient came to my office, hearing gradually becoming more clear and the noises diminishing. There was a slight disturbance in sense of taste.

Reproduction of the drumhead began early in April and the opening in the course of some months almost closed, the granulating process being attended by more or less discharge. The results of this operation were so gratifying that on June 5, 1890, I performed the same operation on the right ear, which subsequently took about the same course the left one had done. The case was not seen during my absence in Europe for the summer, but when examined in October both drumheads were almost reproduced by new-formed tissue, small openings only remaining in either. An attempt was made to maintain more free openings by treating the new membranes with traumaticine in which salicylic acid had been dissolved. The effect of this was to enlarge the openings somewhat, but they constantly showed a tendency to reproduce themselves. I finally restricted the patient's diet very much for some weeks, and then, after deadening the sensibility of the reproduced membranes with a ten-per-cent. solution of cocaine, cut them away, and there has been no return. When examined in March, 1891, the openings were large and the drums dry.

The patient is now able to enjoy social life again: can keep up conversation in the drawing-room or at the dinner-table without effort. The opera and theatre are once more a source of

pleasure, though at the latter she cannot sit farther from the stage than the sixth row of orchestra chairs. The distressing noises in the head and ears no longer exist. In a word, since the operations she has resumed her former position in family and social life generally, and enjoys the best of health.

CASE 2.—Mr. de C., of New York, age thirty-two, was seen in 1888. First experienced deafness eight years ago, but it did not seriously inconvenience him until four years ago, since which time he has consulted many specialists both in this country and in Europe, generally receiving a discouraging prognosis. The left ear was first affected ; the right ear has been getting worse for two years, markedly so within the past twelve months. Patient was an active member of the Stock Exchange for ten years previously to 1886. He took cold easily, and has had dental irritation. His temperament is nervous. He became much run down while in active business, and the deafness contributed greatly to increase his despondency, since, being very musical, it interfered with musical pursuits. The right drumhead porcelain-like in color, yet translucent enough to allow the long process of the incus to be seen through it. The left was humid and dull in look.

Hearing : In the left ear hears loud voice at five feet, but at twenty feet shouted words are not distinguishable ; watch, $\frac{6}{33}$. Right ear : hears ordinary voice, if plain, five to eight feet, loud voice at twenty feet ; watch, $\frac{6}{33}$.

His general condition delicate ; subject to colds and head-aches.

On *January* 2, 1890, removed drumhead and malleus of left ear, and separated the incus from the stapes. The chorda tympani was divided.

Jan. 3d.—Feels well, is sitting up. Hearing in operated ear : plain ordinary voice at five feet, rather loud at eight feet ; watch, $\frac{8}{33}$. January 10th, when seen at my office, the drum cavity was clear ; slight disturbance in taste.

Jan. 10th.—Hears low ordinary voice in left ear at five feet ; ordinary voice, at ten feet ; plain, ordinary, at twenty feet ; watch, $\frac{c}{33}$.

Jan. 17th.—Reproduction of the drumhead began, the margin widening all around as usual in such cases, with granulation and slight secretion.

February 18th.—The reproduction seemed complete, but on manipulating the parts a large crust came away, leaving a

large opening in the drumhead. The tendency to closure was for several months met by widening the opening slightly with the knife under cocaine, and treating the parts with a solution of acid salicylic in traumaticine, under cocaine, until a firm film was found over the parts. This, when removed after a few weeks, left a large permanent opening. When last seen, February, 1891, the drumhead was absent, and hearing was still good. The patient has also very much improved in general health.

CASE 3.—Mr. C. C. M., of Fairport, N. Y., was first seen by me on March 15, 1889. Had been almost totally deaf in the right ear since having otitis with earaches as a sequence of scarlet fever in childhood. The hearing of the left ear has been defective for past seven years, due to chronic catarrh. He has for many years been overworked and subject to bad colds. There was a sense of pressure and fulness in the right ear. Examination of the right ear discloses a cicatricial retracted drumhead ; the malleus is displaced, its neck presenting below the margin of the auditory plate ; the attachment of the tensor tympani muscle is visible. When the drumhead is touched with a probe, a sound is produced like the crumpling of parchment.

The left drumhead is lustreless and succulent in appearance.

Hearing : Right ear, ordinary voice heard, when spoken half-inch from the ear, at one foot scarcely at all.

Left ear, ordinary conversation heard at one inch if plainly spoken, at one foot hears a word now and then if familiar sentences are used. At three feet hears shouting with difficulty.

The tick of watch not heard in either ear. He does not have much tinnitus, but on over-exertion becomes dizzy. Hears best in a noise, but when tired hears badly, and on some days can scarcely hear at all.

March 16th.—Under ether, removed drumhead and malleus from the right ear. The incus and stapes were not visible, being enveloped in cicatricial tissue. No attempt was made to remove the incus.

On going down to breakfast the morning after the operation, an altered sense of taste was noticeable, but this gradually disappeared in the course of a few months.

When examined at my office on March 18th, the drum of operated ear was dry, and the sense of pressure and fulness absent. He could hear ordinary voice at from three to five feet, and loud voice at twenty feet.

When last seen, September 25, 1890, there was no tinnitus or other sensations in the right ear. The improvement in hearing for conversation remained, and the tick of a watch was audible on contact. The drum was dry and white in color, and there was no reproduction of the drumhead. His general health was excellent.

CASE 4.—Miss D., of Florida, aged fifty-two. Four years ago, after having "malarial" fever, for the cure of which large doses of quinine were taken (for two consecutive days, sixty to eighty grains daily), she experienced great ringing in the ears, which has continued more or less ever since, and from that time her deafness was marked. From 1860 until 1872 she was an invalid, having suffered from nervous prostration, and was treated by Dr. Brown-Sequard for hysterical torticollis of the left side. Has had much dental irritation. Both external auditory canals were sodden and exfoliating from long use of glycerine. The drumheads are dull and humid in appearance.

Hearing: In left ear hears ordinary voice at two feet. In right ear hears low, plainly spoken voice at three or four feet, but it seems muffled. At twenty feet loud voice badly heard using both ears; in fact, not much better at ten feet. There is a wave-like murmur in addition to the ringing, and at times a friction sound in the ears. Her own voice seems so loud to her that she speaks in a low tone.

November 5, 1890.—At Dr. Janvrin's private hospital removed drumhead, malleus, and incus from the left ear.

There was slight purulency for a short time, but the drum soon became dry.

When she left for her home early in December she was feeling well and could hear in the operated ear ordinary voice at four feet, loud voice at ten feet, and fairly well at twenty feet. The tinnitus was decidedly better. The absence of undue tension in the operated ear was a source of great comfort.

CASE 5.—Miss C., aged twenty-two years. Has been more or less on the verge of invalidism ever since childhood. After having typhoid fever at the age of fourteen years experienced a "queer feeling" in the right ear, and was treated for a long time by several specialists. Since the age of seven years was kept closely at school in this country, and in her sixteenth year was taken abroad and spent five years at pretty hard study, including music, with intervals of travelling. The latter was, perhaps, as exhausting as the former.

Was in Europe again in 1890, and overworked herself again both mentally and physically. Spent a month at the Paris Exposition, and afterwards had *la Grippe* for another month. As a result of overwork she has become exceedingly neuropathic, and very much distressed about the right ear, which has become quite deaf, and also the seat of most disagreeable noises. She has scarcely left her bed for the past three months. The noises in the right ear are constant. There is a sound like a "sea-shell," and when she is nervous there are occasional "explosions" like the sudden escape of steam, along with a disagreeable sense of pressure in the ear. The noises often vary. For the past five years the right ear has constantly grown worse, though some of the time under special treatment for the ear or nose.

In the left ear, sixteen months ago, a sense of fulness was experienced, lasting three months, and succeeded by tinnitus now and then, similar to the right ear. She has some "dead" teeth, and has not cut any of the wisdom teeth.

The right drumhead is dull and porcelain-like in color, the malleus handle prominent. The left drumhead is clear but not brilliant.

Hearing: Right ear, ordinary voices six inches. Watch $\frac{0}{60}$. Left ear normal, even hyperacute for voice and watch.

May 6, 1890.—Removed the right drumhead, malleus, and incus; the ossicles were pretty firmly ankylosed, and the incus which was removed first, came away with some difficulty. The drum cavity was dry and white in appearance.

Hearing for ordinary voice in right ear a few hours after the operation twenty feet, low voice at fifteen feet, and noises began to diminish on the second day.

Patient seen in November. Hearing unchanged, and tinnitus so slight as to not cause any annoyance. There was no reproduction of the drumhead, and the drum was white and dry. The general health was improving.

CASE 6.—Miss U., of New York, age thirty. First seen late in the year 1886. Has always had hay-fever for six weeks every summer and is scarcely ever free of head colds. Has been deaf since childhood in both ears, the left being first affected. At age of twelve years was seen by a London aurist, and has consulted many other specialists on both sides of the Atlantic since that time, but all of them finally said they could do her no good and she is, therefore, willing to try any operation that promises

success. It is much more difficult for her to converse with others in consequence of a high degree of myopia, since she is thus deprived the aid of lip reading. Tinnitus exists mostly in the left ear. There is a sense of discomfort in the left ear, and relief is sought by constantly rubbing it. The deafness is greater in damp weather and during the existence of head colds. Hears better in the noise of a ball-room or street-car. At fifteen feet hears familiar sentences spoken in a very loud tone of voice; unfamiliar sentences scarcely heard at all. Hears a König rod vibrating 35,000 per second held close to ears, but does not detect the ticking of a watch on contact. Cannot follow general conversation close by where more than one person is speaking.

January 4, 1887.—With application of a minute quantity of sulphuric acid removed posterior segment of the right drumhead, after which hearing was greatly benefited, the tinnitus in operated ear ceasing. At the opera, dining-table, and in general conversation she heard very well. Test for the voice showed that ordinary conversation could be understood at 15 feet, and the tick of watch at $\frac{1}{3}\frac{1}{5}$ inches. The drumhead, however, gradually closed up again in nine months and the deafness returned, a result that would have occurred, probably, within a few weeks had not the parts been re-opened from time to time.

November 5th.—The drumhead and malleus of the right ear were removed, when hearing again improved as before. There was much difficulty in keeping the drumhead from reproducing. At times it was cut away, and when borne, treated with collodion or traumaticine in which salicylic acid was dissolved. Finally in May, 1888, the drumhead was found to be entirely absent, and good hearing has remained ever since. It was found necessary, in order to accomplish this result, for the patient to practise abstemiousness in diet, and she lived much in the open air, specially during the summer. In consequence of this improved hygiene she was exempt from the usual severe form of hay-fever and seldom had any head colds.

The good results obtained by the operation on the right ear induced the patient to have the left ear treated in the same manner. Accordingly, on April 29, 1890, I removed the drumhead, malleus, and incus from the left ear. In a few days the drum was found white and clear, and ordinary voice could be heard at five feet, and if plainly spoken at twenty feet. The tendency to reproduction was slight and soon ceased, leaving a large opening. When last

seen in February, 1891, patient heard about as well in one ear as the other, though probably from habit of using the right ear almost exclusively for a long time, she fancies it is the better ear. Ordinary voice is now heard in the right ear from ten to twenty feet, and in the left nearly as well. The watch is heard in both ears at less than an inch.

The sense of taste was unaffected at any time. Patient has escaped hay-fever for past two summers. She can hear very well at the theatre when occupying an orchestra chair six rows from the front, and from her box, which is situated almost opposite the stage, can enjoy the opera satisfactorily.

CASE 7.—Mr. H., aged forty-two, New York, came to see me October 10, 1890. Been deaf noticeably for six years. Was informed by a distinguished authority a few months ago that nothing could be done for his case. Patient's business is regulating the tone of piano-fortes. Since becoming deaf he finds his work very difficult, and sometimes impossible altogether. Regulating the treble (upper register) is the most difficult, because as he sits at the instrument the right ear is presented to that side ; the middle register (as would be expected), the easiest. Hunting for the source of jingles and noises makes him very nervous, since he is unable to locate their source. Has severe tinnitus in right ear, like escaping steam. Last December he had a severe fall upon the head, causing concussion of the brain. Since then he is vertiginous and has lost sense of taste and smell.

The drumheads look fairly well, though the right one is somewhat dry and parchment-like. Hearing : right ear, ordinary voice, four inches ; the left, much better—a whisper at three feet. Nov. 9, 1890, removed drumhead, malleus, and incus from the right ear. There was some increase of tinnitus and vertigo at first, but in a few weeks the drum became dry, the *the noise ceasing entirely*. There is slight tingling in the tongue. Hearing in operated ear : low voice at two feet ; loud voice at twenty feet. In about a month the drumhead almost entirely reproduced and hearing diminished. He was, however, able to resume his occupation successfully. Early in 1891 the drumhead was found closed, all but a small opening. The new drumhead being removed, it was found that he could hear ordinary voice at ten feet —a result truly surprising when it is compared to the test made soon after the operation. This opening has remained permanent. The dizziness that followed the fall, over a year ago, remains to some extent, but the tingling has disappeared from the tongue.

The list of cases might be extended, did space permit, but the writer hopes to contribute further to this important subject at another time. The following conclusions are offered, in the meantime, drawn from the cases cited, as well as others occurring in practice.

In certain cases the advance of progressive sclerosis, and consequent deafness, tinnitus, etc., cannot be arrested, nor, indeed, can any permanent improvement in hearing be made by means of any known local medication, directed either to the ear itself or the throat. On the contrary, valuable time may be frittered away in useless experimentation until the disease has become more and more firmly seated. This is the more lamentable in younger patients, where deafness is but beginning, and is therefore amenable to an operation. The deafness due to progressive ankylosis of the ossicula may be arrested in most cases, and where the operation does not improve hearing the further increase of deafness is thus prevented.

That uninformed and inexperienced persons should assert that the operation is both useless and dangerous is to be expected, for opposition to any scientific advance is much easier than making the research necessary to an understanding of the subject. But in some instances there seems to be considerable dread of the operation, due to the belief that a formidable trephining process in the temporal bone is necessary in order to gain access to the parts operated on. This error has gained currency, doubtlessly, from the custom of speaking of either the drumhead or tympanum as the "drum."

The otologist need not, therefore, be surprised that those who have never had the matter explained do not know that all the manipulations in performing the operation are carried on in the ear through the ordinary ear speculum, introduced into the external auditory meatus; that the operation, performed under narcosis, is not attended with any pain, and that there is seldom any reaction or feeling of soreness in the ear afterwards.

Where there is a difference in the hearing power of the two ears the writer usually selects the worse ear for the operation; this rule, however, is by no means always

observed. The operation itself is entirely devoid of danger, no bad effects having ever occurred in my own experience, nor to my knowledge have any ever been reported. It is in all cases performed under narcosis. For many years ether was the anæsthetic employed. More recently I have found the A. C. E. mixture very satisfactory, a small quantity only being required, and nausea seldom following its use. It is composed of one part alcohol, two of chloroform, and three of ether. Antiseptic precautions are always taken. There has always been great difficulty encountered where attempts have been made to establish a permanent opening in the drumhead. The favorite method employed to accomplish this has been the violent removal of the reproduced drumhead and even the bone from which it sprung. It was soon apparent to the writer that the more vigorous the efforts were, in this direction, the more certain was reproduction to take place. It is best, therefore, to keep hands off so long as this process is active, and, if regeneration finally occurs, the newly formed membrane should be carefully cut away with as little irritation as possible. Some restraint in respect to diet is nearly always necessary to be practised by the patient, both before and after the operation. Whenever regenerative action is observable along the incised surface of the drumhead, a thin margin of which nearly always is left after its excision, granulations may be seen springing up, the process being attended by more or less suppuration until a new membrane of greater or less completeness is formed. A rigid enforcement of dietetic rules which almost, or quite, exclude meat, seems to lessen regenerative action.

It has been the writer's practice, even where the patient seems in good health otherwise, to give particular attention to hygienic measures, since there is generally a neuropathic constitution in catarrhal subjects.

I do not always attempt to remove the incus, since it sometimes lies beyond the range of vision, owing to anatomical variations. It is seldom, however, that the incudostapedial articulation cannot be more or less plainly seen by pushing aside the tissues with a probe, and disarticulation

may be easily accomplished without plainly seeing the parts if the anatomy of the region be kept in mind. When the long process of the incus is liberated from the stapes it usually descends somewhat, when its tip can easily be seized with small aural dressing forceps and the incus removed.

As an immediate result of the operation it will generally be found that the hearing for high tones has been improved, sometimes very greatly, so that the rustling sound made by crumpling paper, for example, is painfully loud; and the ticking of a watch is specially well heard. The ability to hear low tones (as of the human voice) is not always improved at first, but develops gradually. I have observed that with the increase of hearing for low tones there was a corresponding decrease in the hearing of high tones.

Some persons experience a new sensation in the operated ear, lasting for a few days, or even longer. There is a consciousness of an entire change in the transmission of sound which is, to some extent, confusing. More sound altogether enters the ear, and it seems "distant" or "crude." Now and then, for the first few days, tinnitus is increased, if present before, but it gradually subsides again.

In a certain number of instances, specially in persons over forty years of age, all of the symptoms are not greatly relieved. It must be kept in mind, however, that when from chronic middle-ear catarrh deafness is steadily advancing, we know of no other way of arresting its progress excepting by the operation under consideration, and, in fact, in many cases this is the main object for which it is performed.

The sense of taste being liable to disturbance when the malleus is taken out before the incus, I usually remove the latter first, since the chorda tympani may in this way escape injury. When it is considered that the sense of taste is affected in many inflammations of the middle ear, it is surprising that it is so seldom experienced in these operations. The operation itself usually requires about five or ten minutes for its performance after the patient is anæsthetized. The details of the operation have been often given,

and would be out of place in this connection; those who may not be familiar with the literature of the subject will find full descriptions of the steps of the operation and illustrations of the instruments employed in the writer's work on the ear.[1]

The drum of the ear requires no special care after removal of the drumhead, its lining membrane soon being transformed from a mucous membrane to a dry insensitive one, of a cicatricial or dermoid character.

I do not advise that cotton-wool be worn in the external auditory canal after the operation, unless the ear is naturally sensitive, or when exposed to violent winds or draughts of cold air, a precaution not always unnecessary even when the drumhead is present.

In some instances, after repair has taken place, an exfoliative process goes on for a short time in the drum or adjacent portion of the external auditory canal, giving rise to discomfort and even slight deafness when the epithelial layer thus formed detaches itself. The crust if let alone may fall out of the canal, or it may be removed with dressing forceps. During the existence of head colds some moisture may be felt in the drum; it seldom occurs and requires no other attention than the application of a little absorbent cotton-wool upon the end of a holder, by which means the parts are easily dried. Sometimes a sensation of warm air entering the drum is experienced on blowing the nose.

For a few hours after the operation, the patients should remain in a recumbent position, and afterwards restrict themselves to the room for a day or two, according to circumstances, avoiding sudden movements of the head. On the fourth day out-door exercise may be resumed. Some patients feel able to go about much sooner than this, even leaving town the day after the operation.

Regeneration of the drumhead cannot be prevented from taking place in a certain number of cases, and where the tendency is manifest it is best to let nature take her course. A new membrane sometimes develops in a few weeks, or

[1] "The Ear and Its Diseases," W. Wood & Co., New York, pp. 358–393.

the reproduction may be only partial. It occurs more frequently in patients where the best results are attainable by an operation, since the cavity of the tympanum is usually much more vascular than in advanced sclerosis where, indeed, vascularity is diminished. The newly formed membrane is found to consist of connective tissue, usually soft in texture, but sometimes thick and tough. After a time it may be easily cut away. I formerly attempted to prevent re-formation by treating the margin left with a solution of salicylic acid in "traumaticine," but from more recent experience I no longer make any application to the parts, but cut away the membrane after the application of a ten-per-cent. solution of cocaine, which renders the operation painless. Sometimes the operation has to be repeated two or even three times before the tendency ceases. The permanent removal of the membrana tympani, it may be said, requires for its success patience and gentleness in the necessary manipulations, but when this obstruction to the entrance of sound to the round window and base of the stapes is no longer present, deafness is relieved; and where rigidity of the ossicles gives rise to tinnitus, etc., these phenomena also cease with the removal of the malleus, or malleus and incus. The accomplishment of the above removes the principal difficulty hitherto encountered in this field. It is only ten years since Voltolini expressed, at the eleventh International Medical Congress, the general belief of otologists in the statement that the maintenance of a permanent opening in the membrana tympani was to him as yet an unsolved problem.

On regeneration, of course, deafness returns, but not so with the other symptoms, as a rule. When the improvement gained by the operation is thus lost, the patient often fancies that the other ear has become more deaf. Hearing returns so soon as the newly formed membrane is removed.

The operation for the cure of discharge from the ear is often even more satisfactory in its results than in catarrh of the middle ear.

BACTERIOLOGICAL EXAMINATIONS OF THE CONTENTS OF THE TYMPANIC CAVITY IN CADAVERS OF NEW-BORN AND YOUNG INFANTS.

By G. GRADENIGO and R. PENZO.

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Translated by Dr. WARD A. HOLDEN, New York.

POLITZER, in his classic work on otology,[1] speaks as follows of the frequent diseases of the middle ear in new-born infants: "I cannot agree with those authors who explain the muco-purulent fluid so frequently found in the middle ear in new-born infants as the product of pathological inflammation, since it seems to me impossible that nearly two thirds of the new-born should suffer from a mucous or purulent inflammation, and I am rather inclined to regard these masses as the degenerated products of the fœtal gelatinous tissue in the middle ear."

A great many authors, among them Wreden, v. Tröltsch, Parrot, Renaut, Barety, Gellé, Hartmann, and Steiner, have described in new-born and young infants, diseases of the middle ear of an apparently inflammatory nature. Many of them do not hesitate to connect these diseases with actual inflammatory conditions.

Bacteriological examinations recently made by Netter, seem to support this view.

Netter[2] found constant changes in the middle ear in a series of twenty autopsies made on infants from nine days to

[1] German edition of 1887, p. 274.
[2] Société de biol., April 20, 1889.

two years of age, and in eighteen cases he found the streptococcus pyogenes thirteen times, the staphylococcus pyogenes six times, and the pneumococcus five times, *i. e.*, the same pathogenic micro-organisms which are found with inflammation of the middle ear in adults.

How can these facts be made to accord with the views of Politzer? How can we reconcile the morbid changes in the middle ear in new-born and young infants, with the absence of corresponding clinical symptoms?

In order to decide these questions we have thought it necessary to make bacteriological examinations of the contents of the tympanic cavity in new-born and young infants.

Our results seem of interest, since they serve, on the one hand, to confirm what Politzer had maintained on the ground of simple anatomical and clinical observations; and on the other hand, explain the apparent discrepancies between those views and Netter's experiences.

Our material for investigation consisted of ten children from the seventh month of intrauterine life to the age of one year and six months, as follows:

One fœtus of seven months.

Three infants which died at birth.

Three infants which died on the fifth, eighth, and eighteenth day.

One infant which died two months after birth.

Two infants which died one year and some months after birth.

The bacteriologial examinations were made from four to twenty-four hours after death. The technique was the same in all cases, and was as follows:

I. The temporal bones were removed with antiseptic precautions. The instruments were sterilized in the flame or in boiling water; sublimate was used for the hands and the temporal bones. The latter were not immersed in the sublimate, however, since this might have disinfected the tympanic cavity also.

II. A small intra-muscular vein of the mastoid region was opened, and its blood inoculated on gelatine and agar-agar having an inclined surface.

III. The cavity of the tympanum was opened from above, after the integrity of the membrana tympani had been established by the removal of the anterior wall of the external auditory canal.

IV. Through the opening in the tegmen tympani, a sterilized platinum loop was passed into the cavity of the tympanum, and brought into contact with its various parts. We then made :

a. Puncture inoculations in gelatine and superficial linear inoculations on agar-agar with an inclined surface.

b. Isolated plate cultures on agar-agar and gelatine, after previously diluting the inoculated matter with distilled and sterilized water.

c. Cover-glass preparations of the contents of the tympanic cavity.

V.—We put the temporal bones, for microscopic examinations, first into one third alcohol, then in stronger and finally ninety per cent. alcohol.

VI.—The bones were decalcified in the usual manner with nitric acid, 3.5 parts, sodium chloride, 0.75 parts, and distilled water, 100 parts.

The results of our examinations were as follows:[1]

I.—Fœtus of seven months, born prematurely, dead immediately after birth. Examination twenty-four hours after death.

The cavity of the tympanum contained a reddish-yellow gelatinous mass, infiltrated with blood.

The cover-glass preparations showed : right, numerous large cocci ; left, nothing.

Cultures of the blood from a vein in the mastoid region remained sterile.

From the contents of the tympanic cavity there developed : right, the *micrococcus cereus albus* (Flügge) ; left, nothing.

II.—Child born at term, died in birth. Examined twenty-four hours after death. In both tympanic cavities there was a black mass consisting for the most part of blood.

Cover-glass preparations showed cocci and diplococci on both sides, and also short bacilli on the right.

[1] These observations were kindly verified by Dr. Bordoni-Uffreduzzi, to whom it is our pleasant duty to express our thanks.

Cultures of the contents of the vein remained sterile.

Cultures from the contents of the tympanic cavity showed: right, the *micrococcus cereus albus* and the *bacillus iridescens*; left, the *micrococcus cereus albus* and the *micrococcus subflavus.*

III.—Child dead during birth at term. Examined four hours after death. Cavities contained a small quantity of thin mucous fluid with thick yellowish-white flocculi. Preparations and cultures negative.

IV.—Child born at term, dead immediately after. Examination eighteen hours after death. Both cavities contained a gelatinous reddish mass.

Cover-glass preparations showed cocci and bacilli on both sides.

Cultures of the contents of the vein remained sterile.

In the cultures from the contents of the cavities, the following developed: right, the *bacillus fluorescens putridus*, the *bacillus fluorescens*, the *bacillus luteus*, the *micrococcus flavus tardigradus*, and the *micrococcus roseus;* left, the *diplococcus lactis faviformis*, and the *bacillus fluidificans parvus* (Maggiora).[1]

V.—Immature fœtus, dead five days after birth. Examined twenty-four hours after death. Mucous membrane of the cavities swollen and red, and cavities contained a reddish-yellow fibrinous fluid of purulent appearance.

Cover-glass preparations showed: right, short bacilli and cocci; left, bacilli.

Cultures of the vein contents sterile.

The cultures from the contents of the cavities showed: right, the *bacillus aërogenes lactis*, the *micrococcus cereus albus*, the *micrococcus flavus tardigradus*, and the *micrococcus flavus liquefaciens;* left, the *bacillus aërogenes lactis.*

VI.—Immature fœtus, dead twelve days after birth. Macroscopically similar to preceding case. Examined twenty-four hours after death.

Cover-glass preparations showed numerous cocci and bacilli on both sides.

Blood cultures sterile.

Cultures of the cavities showed, right and left, the *bacillus aërogenes lactis* and the *micrococcus cereus albus.*

VII.—Infant born at term, dead eighteen days later, of catarrh of the stomach. Examined twelve hours after death. Tympanic

[1] Maggiora, Contributo allo studio dei microfiti della pelle umani, etc. *Giornale d Igiene*, Marzo, 1879.

cavities contain a small quantity of a fibrinous citron-yellow fluid.

Cover-glass preparations and blood cultures negative.

Cultures of the contents of the cavities showed: right, the *bacillus aërogenes lactis* and the *micrococcus cereus albus;* left, the *diplococcus lactis faviformis*, the *micrococcus cereus albus*, and the *micrococcus flavus liquefaciens.*

VIII.—Infant born at term, dead two months later of catarrhal pneumonia. Examined twenty-three hours after death. The mucous membrane of the tympanic cavities was somewhat swollen and red, and contained a fibrinous yellow fluid of purulent appearance.

Cover-glass preparations showed bacilli and cocci on both sides.

The blood cultures remained sterile.

The cultures from the contents of the cavities showed on both sides the *bacillus aërogenes lactis* and the *micrococcus cereus albus.*

IX.—Badly nourished, rhachitic infant, one year and four months old. The autopsy gave negative results. Examination twenty-four hours after death. The mucous membrane of the tympanic cavities was red and swollen, and the cavities contained a small quantity of a reddish-yellow fibrinous fluid.

Cover-glass preparations showed numerous cocci.

Blood cultures remained sterile.

Cultures were made only from the right side, as antiseptic precautions could not be taken with the left. Cultures showed the *micrococcus ureæ liquefaciens.*

X.—Infant one year and six months old, dead of catarrhal pneumonia. Tympanic cavities contained a reddish-yellow fibrinous fluid.

Cover-glass preparations showed: right, numerous cocci; left, a few cocci.

Blood cultures sterile.

Cultures from the contents of the cavities showed: right, the *diplococcus lactis faviformis*, the *micrococcus candicans*, the *micrococcus cereus albus*, and the *micrococcus ureæ liquefaciens;* left, the *micrococcus subflavus*, and the *micrococcus cereus albus.*

In summing up the results of these examinations, we shall separate those made on infants who died at birth or immediately after, from those made on infants which lived a considerable time after birth.

It is remarkable that the bacteriological examination of the infant of the first category which we were permitted to examine four hours after death, was negative.

In the other cases, examined eighteen to twenty-four hours after death, we found the following micro-organisms: the *micrococcus cereus albus* (very frequently), the *micrococcus subflavus*, the *bacillus iridescens*, the *bacillus fluorescens*, the *bacilllus fluorescens putridus*, the *bacillus luteus*, and the *bacillus flavus tardigradus*.

In the second category we found the *micrococcus cereus albus* (frequently), the *micrococcus candicans*, the *diplococcus lactis faviformis*, the *micrococcus flavus*, the *bacillus lactis aërogenes* (frequently), the *bacillus flavus tardigradus*, the *bacillus flavus liquefaciens*, and the *bacillus ureæ liquefaciens*.

We notice that the bacillus lactis was found frequently in cases of the second category only.

The bacteriological diagnosis was made for each species according to the characteristics given by Flügge[1]—*i. e.*, in respect to the peculiarities of the growth of the microbes in different culture media, to their dimensions, and to their action on animals.

As is seen in the reports, no one of the microbes found is pathogenic; we have injected most of them under the skin and into the peritoneal cavity of white mice, without producing the slightest local or general reaction; the microbes are therefore certainly products of decomposition.

Our classification cannot be considered complete or definite, since great uncertainty still exists in regard to the saprophytic microbes; we have called all the species found, by the names which Flügge has given them, since they have the characteristics which Flügge has described for these forms.

In every case we found lesions in the tympanic cavity, which might be ascribed to inflammatory processes; the membranæ tympanorum were unruptured, but more or less reddened; the mucous membrane of the cavity was red and swollen; the fluid contained within the cavity was in some

[1] "Microorganismen," Leipzig, 1886.

cases bloody, and in some of a purulent appearance and fibrinous.

These lesions evidently correspond to those which other authors have seen and described in new-born infants, and which were regarded as due to severe inflammatory processes.

The results of our bacteriological examinations are of importance, since in the nineteen temporal bones of the ten cases all the micro-organisms found were saprophytic and not pathogenic.

We may therefore conclude that the changes in question, which we found constantly in the middle ear in infants, were dependent not upon actual inflammatory processes, but upon particular post-mortem changes which, under the influence of the commencing decomposition, usually affect the delicate portions of the infantile middle ear, such as the mucous membrane, the membrana tympani, and chiefly the gelatinous tissue.

According to our explanation, there is a rapid decomposition of the gelatinous tissue and the mucous membrane of the tympanic cavity; and thus Politzer's opinion, founded only on an anatomical and clinical basis, is confirmed.

If there had been a true inflammation in these cases, then almost all infants must suffer from severe inflammations, which is contradicted by daily experience.

Our conclusions seem to differ greatly from those of Netter, but on closer examination the difference is seen to be only apparent.

Netter examined eighteen infants from nine days to one year old, two of which died of meningitis purulenta, one of abscess of the lung, four of measles, four of diphtheria, and besides this fourteen had a broncho-pneumonia. In the majority of the cases which we examined, the infants died either at birth or on account of immaturity. Only three had diseases, and these were such as are not usually followed by *otitis media*. Our examinations showed further, that the contents of the tympanic cavity in infants rapidly undergo decomposition, and thus present favorable conditions for the development of saprophytic micro-organisms. It does not

surprise us then, in Netter's cases in which the infants died of severe general infectious diseases which are often followed by otitis media, that the tympanic cavities contained not only saprophytic micro-organisms, but also pathogenic micro-organisms due to the general infection.

We conclude, therefore, from our investigations, that the changes which are found very frequently in the tympanic cavity in new-born and young infants, depend in the majority of cases upon the rapid decomposition which the delicate tissues of the middle ear undergo at this age, and not upon inflammatory processes, since no pathogenic micro-organisms are found.

A CASE OF ACUTE INFLAMMATION OF THE MIDDLE EAR WITH UNUSUAL CEREBRAL SYMPTOMS.

Clinical Report.

By Prof. AD. BARTH, Marburg, Germany.

Translated by Dr. Ward A. Holden, New York.

(*With one figure in the text.*)

OF the various cases of aural disease which I have observed and treated lately in the nerve department of the Charité, in Berlin, the following seemed worthy of notice because of its very unusual course. For the greater part of the history relating to the general condition of the patient I am indebted to Dr. Siemerling. Our diagnosis was acute meningitis (probably) following an acute inflammation of the middle ear. I shall not indulge in any theoretical discussion of the case.

Max R., æt. sixteen, was admitted to the hospital December 30, 1889, in an unconscious condition. His mother stated that he had been well until the day before. December 29th his mother asked him to dance with her, and at that moment he fell, and remained unconscious up to the time of his admission to the hospital. No twitching was noticed.

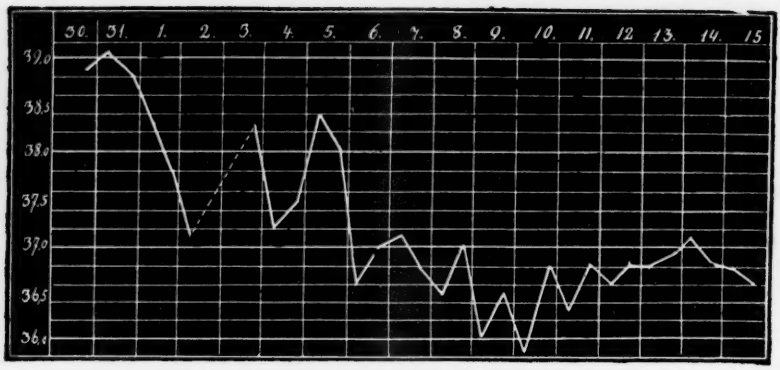
December 31st a more careful examination was made. Pulse 88, regular and strong. The patient is completely stupefied; respiration (24) is of a snoring character; the eyes are closed. The arms are flexed, the legs are frequently stretched out and then drawn back, and when they are raised passively, sink slowly again.

Since the muscles are made tense in the examination, the knee-jerk could not be tested. He reacts with expression of pain when pricked with a pin, and moves freely. The head deviates toward the left side, but is freely movable. The pupils are of equal width and average size, and react promptly to light. There is no discharge from the ears. The lower jaw may be separated from the upper without resistance. The tip of the tongue lies between the teeth, and shows the impressions of the teeth, but has not been bitten. The lung shows no dulness in front or behind ; low down on both sides a humming respiration is heard, but no râles. The urine has passed involuntarily, but no stools. In the evening the condition was the same. Patient had taken no nourishment, and the urine had not been passed again. Pulse 88, regular and strong. Knee-jerk obtained on both sides.

January 1, 1890.—Pulse 80, regular and strong. Patient passed urine in the night. Has not spoken. Some fluid nutriment has been taken.

January 2d.—The condition is the same ; coma continues. The patient is restless. No stiffness of the neck ; repeated grating of the teeth. He was fed morning and evening by means of a tube. In the evening he vomited shortly after being fed. He emits growling sounds. Knee-jerk present both sides. Pulse 84 and strong. Ophthalmoscopic examination by Dr. Uhthoff revealed nothing. Pupillary reaction normal.

January 3d.—Pulse 84 and regular. Condition unchanged. To-day a discharge from the left ear, partly clear, partly yellow, is noticed. At Dr. Siemerling's request, I examined the patient and treated him until he was discharged. The patient is comatose, and lies with his eyes closed. There is no trace of paralysis or contracture. There is prompt reaction when he is stuck with a pin. The tongue is thickly coated ; marked fetor *ex ore*. The right ear is apparently healthy. Exteriorly the left ear shows nothing in particular. The mastoid process is free, not swollen, and not sensitive to pressure. When strong pressure is made on any portion of the cranium, the face is contorted and the head drawn away. The left auditory canal contains a sero-purulent pulsating secretion, mixed with small bits of epidermis. After being cleansed, the bony canal is seen to be reddened and somewhat swollen. There is a marked bulging of the posterior superior wall of the bony canal and of Schrapnell's membrane. The examination with the speculum is undoubtedly painful.



TEMPERATURE CURVE.

[The recording of the temperature of the second evening and third morning was neglected.]

Therapy: incision of the swollen part down to the bone; leeches to the mastoid process; ice-bag. Pulse 96.

January 4th.—Pulse, 96 morning; 92 evening.

January 5th.—Pulse 96.

January 6th.—Pulse, 92 morning; 72 evening. The coma is not so deep since yesterday morning, and the patient opens his eyes when called to. When an attempt was made to feed him with a spoon, he swallowed a few mouthfuls, and then sank back into a comatose condition. He was therefore still fed with a tube. Urine and fæces passed. In the evening he is again able to swallow; opens his eyes and looks about, but does not speak. When his head is moved passively, he distorts his face. There is no expression of pain when the head is percussed, but pressure on the left mastoid process elicits it. Pressure on the right mastoid process also causes distortion of the face. The secretion was fairly abundant for an acute inflammation of the middle ear, was bloody at first, but has now become less. The redness and swelling are also less marked.

January 7th.—The pulse for the following days varied between 70 and 80.

January 23d.—The patient sits upright in bed, and looks about. His face assumes an anxious expression whenever any one approaches or addresses him. One day, suddenly and without cause, he began to belabor the patient in the next bed with a boot which lay near. He does not speak, and seems not to hear what is said to him. He is now out of bed and goes about the room, his

actions giving one the impression that he is deaf and dumb ; he follows everything with his eyes, but stares at any one who addresses him and draws away. Involuntary passages are less frequent. The patient has said yes and no a few times. Lately he has become more approachable, and gives his hand to the physician of his own accord. To-day he replied to a salutation, spoke well, and answered questions. Then suddenly he stopped, shook his head, and refused to speak further. There has been no secretion from the left ear for several days, but the psychic condition of the patient prevents an examination of the hearing power. To-day examination shows fresh blood dried on the posterior margin of the membrana tympani and in the auditory canal. The patient has recently put his finger into the left ear very often, and has probably wounded himself.

February 21st.—The condition of the patient has been good for more than fourteen days. He was dismissed cured to-day. He remembers very indistinctly the events which happened at the beginning of his disease. He remembers that he was at a Christmas gathering, and feeling well. His mother wished him to dance with her ; he declined, however, as he soon became dizzy and could not dance. He suddenly lost consciousness, and only recovered his senses after he had been a considerable time in the Charité. The patient is now friendly and talks well. There is no headache, no dizziness. The left membrana tympani is healed, and the hearing on both sides is normal.

CROUPOUS RHINITIS.

By GREVILLE MACDONALD, M.D., London,

PHYSICIAN TO THE HOSPITAL FOR DISEASES OF THE THROAT, LONDON.

THAT a croupous form of inflammation should attack the mucous membrane of the nose, as well as that of the bronchial tubes or the larynx, can be a matter of no surprise to the pathologist, although as a clinical fact it has only very recently attracted the attention of experts. Even apart from the analogous condition occasionally found in the bronchial tubes, it would cause but little surprise to the rhinologist, seeing that he not infrequently actually, although inadvertently, induces the precise condition. This occurs subsequently to the application of the electric or other caustic to the rhinal mucosa, when, on the day following the application, large masses of false membrane, firm, though transparent and finely fibrous, may be found extending for wide distances from the spot actually cauterized, sometimes almost blocking up the fossæ. As the cauterized membrane is approached, the false membrane becomes firmer and more closely adherent, until over the slough itself it resembles the false membrane of diphtheria, in that it cannot be removed without a certain amount of force and the production of hemorrhage. In this consideration one can but recall the observations of Senator on the relation of croupous to diphtheritic membranes, the difference between the two, according to him, consisting merely in the different intensity of the inflammatory process in the two cases, whatever may be the initial cause of the inflammatory action. He says: "There is never any sharp boundary line between these

processes; and in particular it is in many, indeed, in most, cases quite impossible to say where the fibrinous superficial exudation, the croup membrane, ceases, and the pseudo-membranous slough, the diphtheritis, begins."[1] He then proceeds to draw an analogy between this condition of affairs and that encountered in the inflammation produced on the skin by the actual cautery: "Where the action has been most energetic you find a slough; beyond that an exudation in the form of a bladder or vesicles, consisting of pus corpuscles and an albuminous material, which coagulates on exposure to air on opening the vesicles, and which is therefore fibrine," etc. He then accounts for the different appearances in inflammation of the skin and of the mucous membrane by the difference in anatomical structure; but had he had the opportunity of witnessing the changes following the application of the actual cautery to the mucous membrane of the nose, the correctness of his analogy would have been even more forcibly presented to him. In fact, the exudation produced after the application of the electric cautery and that formed in the course of an attack of croupous rhinitis are identical both in microscopical and macroscopical appearance. Consequently, seeing that the possibility of these cases being diphtheritic may be excluded, we are justified in assuming that the croupous exudation, which sometimes occurs as the result of an acute rhinitis, but expresses the greater intensity of the inflammatory action, exhibited as a consequence of ordinary cold-taking in certain individuals peculiarly predisposed. So much may suffice for a definition of croupous or, as it is sometimes called, pseudo-membranous rhinitis.

There does not appear to be any special constitutional factor in the development of the affection. We find it in the anæmic and the full-blooded equally with the neurotic. All that can be affirmed in this connection is that one attack predisposes to another; from which it would appear that idiosyncrasy is largely responsible for the peculiar manifestation of the inflammatory attack. Probably climatic cir-

[1] German Clin. Lectures, 2d Series, New Syd. Soc., 1877. Art. "Synanche Contagiosa," p. 415 *et seq.*

cumstances contribute to the etiological factors, since the disease appears to be more frequent in America than in Europe. Nor is this surprising when one remembers the greater prevalence in the former continent of all forms of nasal inflammation.

All observers appear to be perfectly satisfied that croupous rhinitis is quite unassociated with diphtheria, although certain authorities have described cases as occurring during epidemics of the latter. But such cases must obviously be excluded, as they should be described rather as nasal diphtheria. Clinically the membrane differs in its objective appearances from the diphtheritic in that it is usually not adherent, and may be removed without producing any hemorrhage or abrasion of the surface. Moreover, the mucous membrane, so far as the writer's observation of five cases instructs him, may be, though greatly swollen, rather paler than the color of health; it may have, in fact, a somewhat œdematous appearance. This croupous inflammation of the nasal mucosa not uncommonly results, as has already been remarked, artificially, subsequent to electric or other cauterization of different regions of the nose; sometimes extending over wide surfaces, the limits being at considerable distance from the site of the application. This fact seems to indicate that the membranous production is the result of an unusually intense inflammatory action. In the idiopathic croupous rhinitis the extent of the patch may vary from the size of a small pea or even smaller, to such a size that the whole of the nasal and naso-pharyngeal mucous membrane is covered with a thick, gelatinous but firm membrane, which may be withdrawn from the nose with forceps and without the production of any hemorrhage. On the posterior wall of the pharynx may be seen round or lenticular isolated patches lying on an unnaturally pale base. These, though more adherent than the membrane in the nasal fossæ, can be peeled off with a brush or pledget of cotton-wool, leaving a surface somewhat heightened in color, and occasionally slightly hemorrhagic. Indeed there appears to be no pathological reason why in the same case the membrane should not be merely croupous in part of its ex-

tent, though here and there adhering close enough to involve some superficial sloughing; in which event it must closely resemble a diphtheritic membrane. Sometimes the affection is confined to the pharynx and naso-pharynx. In one of two such cases observed by the author the disease lasted ten weeks, without any elevation of temperature or other disturbance of health, the only complaint being of the slight soreness. In this case the patches were regenerated from day to day after removal, while they indicated no tendency to involve other regions, or even to extend their own dimensions.

The subjective symptoms are usually those of an ordinarily severe rhinitis, the temperature being raised to 100° or 101°. There is more or less occlusion of the nose, with a profuse flow of watery mucus, pieces of membrane being occasionally extruded on blowing the nose. In some cases, especially perhaps where the production of membrane is not great, there is severe paroxysmal sneezing, which may sometimes be allayed on the removal with forceps of a small portion of false membrane. Patients who have once had an attack appear in some cases predisposed to another, while in others there is a certain chronicity in the course of the symptoms. To the latter point Dr. Potter, of Buffalo, has referred.[1] In one of the author's cases there appeared at each attack, the patient having had a great number, a wide patch of erythema, extending across the bridge of the nose.

Schuler has noticed the association of a membranous rhinitis with facial erysipelas.[2] After the removal of any portion of the false membrane, there is a strong tendency to its regeneration. The duration of the affection, as will be gathered from the preceding remarks, is very variable. Potter, who has recorded the largest number of cases, gives the average as three weeks. But occasionally cases run a chronic course.

As far as treatment is concerned, there is little to suggest beyond such remedies as are likely to be of service in an ordinary case of acute rhinitis. Hot fomentations to the

[1] *Journ. of Laryng.*, March, 1889.
[2] *Jahrbuch für Kinderh.*, 1871.

nose and eyes have appeared to be of special service, while irrigations of weak solutions of borax have a soothing effect. The membranes, if extensive, should be removed as fast as they accumulate; and in cases where they are so large that they cannot be extruded by blowing the nose, they should be removed with forceps. Cocaine appears to have neither anæsthetic effect nor power of contracting the swollen turbinated bodies in these cases—a fact noted by other observers. This anomaly has also been frequently noticed by the writer in cases of sharp inflammation following the electric cautery or other operation.

Potter mentions the various remedies he has employed, but concludes his remarks on treatment by asserting that he does not think that by any means the duration of the affection was shortened. Nevertheless he has found great relief experienced by the introduction into the nasal fossæ of dry tampons of cotton-wool. These, absorbing the excessive mucus, swelled, and, by their pressure on the erectile tissue, effected that reduction in size which the cocaine was unable to accomplish. "Often a series of pellets was introduced one after another, each being left *in situ* for five minutes or more; and this plan seemed to work very well" *(loc. cit.)*.

The literature of the subject is not extensive, many of the cases recorded as pseudo-membranous rhinitis being obviously instances of diphtheria of the nose. The best account has been given by Potter, of Buffalo, to whose paper on the subject ample reference has already been made. But in certain respects his account differs from that given above, so far in fact as he asserts that the membrane cannot be removed without leaving a bleeding surface. Whether this be so or not in any particular case depends, in all probability, on the intensity of the inflammatory action. Gluck[1] has also recorded some cases and Chapin[2] has given us a good *résumé* of the subject.

[1] Glück, *Med. Record*, April, 1889.
[2] *New York Med. Jour.*, 1890.

MEASUREMENTS OF THE HEIGHT OF THE CUPOLA OF THE TYMPANUM.

By C. KLINGEL, Berlin.

Translated by Dr. Ward A. Holden, New York.

(*With one figure in the text.*)

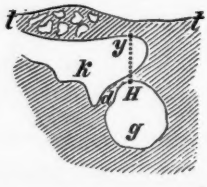
I HAVE lately had the opportunity of studying 47 macerated specimens of the petrous portion of the temporal bone, from Dr. A. Hartmann's collection, and have paid special attention to the height of the so-called cupola of the tympanum. It may be of interest to present these measurements, since the subject has not been much treated of in German literature.

Samuel Sexton was the first to describe the cupola (Trans. Amer. Otol. Society, vol. iii., p. 387, 1882–1887). He spoke of certain inflammations of the middle ear which affect the atticus, as he called the cupola, and which may appear in an acute or a chronic form. He gave a detailed description of the atticus in its relations to the rest of the tympanum, the external auditory canal, and the surrounding bony parts. This description is in part a citation from Leidy (*Science*, May and June, 1883), and in part the result of his own investigations.

Politzer, in his text-book, described as the upper part of the drum cavity, that space above the membrana tympani which arises from the difference in height between the upper bony wall of the external canal and the upper wall of the tympanum, in which space lie the head of the malleus and the body of the incus. According to Politzer the

distance between the roof of this cavity and the head of the malleus is on an average 5–6 *mm.* Hartmann (" Diseases of the Ear," Berlin) suggests the name " cupola " for this cavity.

If the petrous portion of the temporal bone be divided by a vertical section at the inner margin of the roof of the external canal, or a little external to this, we get the appearance shown schematically in the figure. In this case the section lay somewhat more external to the inner termination of the auditory canal, and the latter is seen to be separated from the cupola by a thin plate of bone. The section passed through the cupola, since this lies not only directly above the tympanic cavity, but also extends a short distance outward above the canal. Behind the cupola is the entrance to the mastoid antrum, which entrance passes backward and outward. The transition to the Eustachian tube anteriorly is not seen, since this passes forward and inward. Above



the cupola lies the tegmen tympani, which in this case is very thick, measuring at least 1 *mm* and consists posteriorly of spongy tissue; *t* is the tegmen tympani, *k* the cupola, *s* the roof of the external auditory canal, and *g* the external auditory canal. If the highest point of the arched roof of the external canal at the top of the Rivinian segment be taken, and a line from this point (x) be drawn vertically upward to the under surface of the tegmen tympani, a second point (y) is gotten. The distance between these points x and y varies in different individuals.

The measurement of the distance between x and y in the 47 specimens was made in the following manner. A number of pieces of brass wire were bent at a right angle at different distances from the end, so that the bent portion had a length varying from 1 to 8 *mm.* These wires, beginning with the smallest, were successively laid at the internal end of the auditory canal, until one was found whose bent portion just

touched the tegmen tympani. In this way I found the value of the line *xy* to be 3 *mm* in 6 specimens; 3–4 *mm* in 6; 4 *mm* in 17; 4–5 *mm* in 9; 5 *mm* in 7; and 5–6 *mm* in 2.

4 *mm* was the length most frequently found, and 5–6 *mm* was seen in but 2 specimens. This is at variance with Politzer's statement that the average distance between the head of the malleus and the roof of the upper part of the drum cavity is 5–6 *mm.*

An instrument bent at a right angle, introduced into the cupola at the highest point of the Rivinian segment, could easily reach the tegmen tympani if the bent portion had a length greater than 3 *mm.* When it is remembered that the tegmen tympani is often as thin as paper, and shows fissures of varying width, it is seen that injury to the dura mater or to the brain itself is not impossible. The danger is less when the bent portion of the instrument is not carried into the cavity vertically, but directed backward; for as the figure shows, the distance between the upper wall of the auditory canal and the tegmen tympani increases posteriorly. The knife-shaped instrument used in Schwartze's clinic for removing the incus, and the instrument which Sexton has recommended for the same purpose (Trans. Amer. Otol. Society, vol. iii., 1882–1887), have a bent portion 4–5 *mm* long, and might injure the dura mater if the operator were not careful to turn the instrument immediately backward.

But the danger is not altogether avoided in this manner, since the narcotized patient may suddenly move his head, and thus the instrument be thrust forcibly against the tegmen tympani, against the will of the operator. And in the living it is never known in a given case whether the tegmen tympani be relatively thick or quite thin, whether its substance be compact or spongy, and whether fissures exist or not.

In conclusion I would express my thanks to Dr. Hartmann for suggesting this subject to me, and for kindly placing his specimens at my disposal.

A CASE OF FOREIGN BODY IN THE TYMPANUM.

By Dr. B. MANDELSTAMM, of Kiew, Russia.

Translated by Dr. J. A. Spalding, Portland, Maine.

THE case of a foreign body in the tympanum, published by Dr. Elizabeth Sargent in these ARCHIVES, vol. xvii., p. 102, is of great interest, not only on account of the ingenious method in which it was removed, but as a proof of the resistance of the tympanic mucous membrane to impacted foreign bodies, and the various attempts made to remove it. In this case of Dr. Sargent's, the foreign body remained in the middle ear more than a year; many attempts were made to remove it, and all of them without any marked reaction on the part of the deeper tissues of the ear, the meninges, or the general health of the patient.

It is true, on the one hand, that many cases have been published in which a foreign body has remained in the middle ear for a week or two, or an entire month, has then caused meningitis, and severe constitutional symptoms, and even death.[1] Yet, on the other, there have been but very few cases reported in which a foreign body has remained quiescent in the tympanum for any great length of time. Even so skilled an aural practitioner as Schwartze, regards such cases as an extreme rarity, although he cites Voltolini's case of a drainage tube remaining in the middle ear five years.[2]

[1] The most extraordinary case of this nature was reported by Prof. Bezold, *Berlin. klin. Wochensch.*, 1888, No. 26, p. 524.

[2] Schwartze, *Chirurg. Krankheiten d. Ohr.*, p. 244.—I have discovered a case of Hedinger's (these ARCHIVES, vol. xv., p. 244) in which a molar tooth remained in the ear of a patient fifteen years. But as this foreign body only

For these various reasons I feel justified in reporting the following interesting case in full detail:

In July, 1888, I first saw a boy of eleven, into whose left ear a cherry-stone had been thrust by a comrade whilst at play. The physician who had been called endeavored (without a mirror) to remove the foreign body with a pair of forceps, but without any other result than to excite profuse hemorrhage and excessive pain. A few days afterward the boy was brought to me. I was unable at first to make a critical examination of the meatus, as it was completely filled with coagulated blood. After this had been removed by syringing, and the passage dried with cotton, I saw a rose-colored surface at the inner end of the swollen and narrow meatus, and completely filling the annulus tympanicus. As it felt stony to the probe, and was quite immovable, I saw at once that it was the convex surface of the cherry-stone that had been pushed completely into the tympanum. The *Mt* was invisible. The good ear carefully closed, the boy could hear with the left ear a loud voice at 60 *cm.*

The boy's general condition was excellent; but the parts were so much swollen, that I at once directed instillations of alcohol to reduce this state of affairs. After a few days, the swelling had decreased so perceptibly, that a small opening was visible between the foreign body and the annulus, both above and below, whilst the entire surface of the foreign body was visible. Pus was welling through the fissures above and below.

The foreign body was now so firmly wedged into the annulus tympanicus that it could not possibly be removed with the syringe. I passed injections of water through the Eustachian tube, and a few drops of water made their way through into the external meatus, but without starting the cherry-stone. The boy was so restless when I endeavored to remove the stone, first with a probe, and then with an extraction hook, both from above and below, that I was obliged to resort to chloroform, intending to loosen the auricle from behind, in order to prevent the suppuration from extending into the deeper portions of the ear, and to seize the foreign body with the same forceps that I had previously employed. The first step in the operation was carefully performed without any

partially projected into the tympanum through a perforation of the *Mt* whilst the greater portion, according to the description, lay in the meatus externus, yet this case, strictly tested, does not come under the category of foreign bodies wholly in the tympanum.

accident, and the auricle rolled over and forward. After the abundant hemorrhage had been stilled, I succeeded in introducing the forceps and grasping the offender with both branches. Unfortunately, I then employed too much force, and so split the stone into fragments. But as I succeeded in bringing away a large portion of the hard shell, and then several splinters, and finally washed out with the syringe the entire contents of the pit, I thought that only a little of the substance had been left behind. And as it was rational to suppose that the subsequent suppuration would extrude whatever was left, I made no further search, but terminated the operation by suturing into place the auricle, which soon united by first intention. The suppuration, however, still persisted, and as the father could not longer remain in Kiew on account of his business affairs, I dismissed the patient with directions to have the ear syringed daily and abundantly with a boric acid solution, and to continue the instillations of alcohol until he could come back with the boy.

I did not see the patient for six months. The suppuration had persisted without any intermission, though it had varied at times in amount. The boy had been perfectly well, and had not complained of any pain in the ear. The treatment had been carried out intelligently, and as directed, ever since the previous visit. Examination of the ear showed it entirely free of swelling, so that the meatus and tympanum could be thoroughly examined. I plainly saw in the tympanum an apparently small bit of the old foreign body, with its edge directed upward, whilst the lower portion was seen to extend to the floor of the tympanum. I introduced the forceps experimentally, succeeded in grasping the fragment, but on attempting to withdraw it, it broke off from the rest, and only the small portion between the teeth of the instrument came away. The boy would not let me introduce the forceps a second time, and as the father was compelled to leave, the two departed for home the same day on which they had arrived.

It was October, 1889, before I saw the patient again in the best of health, but with some swelling at the inner ends of the meatus, near the annulus, and on it a small projecting granulation. The pus in the meatus was very offensive to the smell. I snared off the granulation, cauterized it deeply with chromic acid, and applied an iodoform tampon. This I continued for several days, and then under narcosis incised the constricted meatus, and so far as was possible cleansed the tympanum of its granulations with a

small sharp spoon. The tampons were continued for an entire week in order to enlarge the narrow meatus. At the end of this time the constriction was so widened that the remnant of the cherry-stone could once more be seen. Now, as I did not wish to chloroform the boy for the third time, I endeavored to remove what was left of the foreign body under the use of cocaine. I instilled into the meatus several drops of a 20 % solution, and after waiting about twenty minutes I passed a bent hook behind the free edge of the shell, and by a twisting motion upward and outward I succeeded in removing it. Great was my astonishment to find that the foreign body was the LARGER half of the cherry-stone. It had lain with its convexity on the floor of the tympanum, and behind the lower segment of the annulus. Only the free edge of the surface turned toward the observer rose unto sight. I had without any presentiment of the locality of the stone passed the hook into the concavity, and so raised it up and out of its long resting-place. This large, hard, angular bit of shell had therefore remained one year and three months in the tympanum without causing any marked reaction in the deeper regions of the ear or in the meninges, or without exciting any reflex symptoms in any other parts of the nervous system. And more than that, within a week after the removal of the shell, the *Mt* began to regenerate, and at the end of a short time only a minute perforation was visible. To be sure, the regenerated tissue did not resemble the normal tissue of the *Mt*, being highly cicatricial in its appearance, blue, and totally opaque. Nevertheless the hearing was soon so much improved that the boy could hear ordinary conversation at 6 *m*, whilst before he could hardly distinguish the same at 40 *cm*. Unfortunately, he left town unexpectedly, and without notifying me of his intended departure, so that I am unable to report the condition and the final result of the regenerative process in the left tympanum.

SOME POINTS CONCERNING THE OPENING OF THE MASTOID PROCESS.

By TH. HEIMAN, Warsaw.

Translated by Dr. F. E. D'Oench, New York.

I PURPOSE in this paper to call attention to certain points, namely: in what cases and when the mastoid process should be opened. I shall confine myself to a brief presentation of the results of my experience on this subject.[1]

This difficulty and uncertainty not only depend upon the fact that we have as yet no sure indications for all cases, but also upon the further one, which to me seems the most important reason, that we are not always able to diagnosticate the pathological condition which demands the opening of the mastoid process, and so it sometimes happens that the operation is performed when it was not sufficiently indicated; and, on the other hand, the operation is not per-

[1] The aural ward at the military hospital, Ujasdoff, which has been in my charge for the last eleven years, can accommodate 50–60 patients. During the winter months the daily average rises to 100–150. The patients are divided into two classes, those who undergo treatment and those who are received to determine the nature of their affection (men subject to military duty, who, on account of an uncertainty of diagnosis, or the suspiciousness of their disease, are sent from the different districts of Warsaw County [Poland] for final determination of the character of their disease). The average number of these patients for the year is about 1,000. Besides these, policlinical patients come under my care, *i. e.*, patients who are under treatment in different wards of the hospital for other diseases, and where the primary affection, for instance, typhoid fever, etc., is attended or complicated with aural disease. The number of these patients is about 400 a year. The deaf-mutes (subject to military duty) are also sent to me for examination; their average number for the last two years has been about 80. I do not include the patients of my own policlinic (about 1,200 a year), nor those of my private practice, as accurate observation of the disease from beginning to end is often difficult or impossible, as many patients frequently change their physician.

formed in cases in which it not only might have proved of great benefit, but even saved the patient's life.

At present the indications for the operation may be summed up as follows:

1. In acute purulent otitis media, complicated with inflammation of the mastoid process, when the inflammatory symptoms, like the swelling of the skin, the fever, the persistent and severe pain, do not yield to antiphlogistic treatment (ice, leeches) and Wilde's incision.

2. In acute and chronic purulent otitis media, when the escape of the secretion is impeded by granulations in the middle ear or stenosis of the external auditory canal, causing recurrent swelling, redness, and painfulness of the skin of the mastoid process, or in the absence of these objective symptoms, when there is a suspicion of inflammation of the mastoid process.

3. When the mastoid process is apparently healthy, but the removal of pus or cholesteatomatous masses through natural channels is impossible and symptoms dangerous to life manifest themselves.

4. In congestive abscesses and fistulas in the region of the mastoid process.

5. In persistent, continuous pain in the mastoid process, yielding to no other treatment, though there is no retention of pus and the mastoid process seems healthy, especially, however, when it seems sensitive to pressure.

6. As a prophylactic operation, in symptoms, present or absent, of retention of secretion and inflammation of the mastoid process, when death is to be feared on account of imperfect disinfection.

In the course of time I became convinced that these six points do not cover all the indications for opening the mastoid process; they must be extended, and some of the indications must be changed. I find that the operation is also indicated in the following cases:

7. In acute purulent otitis media, in which there is no inflammation of the mastoid process and no retention of secretion, but in which the discharge is very profuse, does not yield to the usual methods of treatment after a certain time

(2 to 3 weeks), or even increases, especially, however, when fever supervenes.

8. When there are distinct symptoms of inflammation of the brain and the meninges, although in such cases the chances of success are very doubtful.

The changes in the indications, which I would propose, affect points 4 and 5. To the indication for opening the mastoid process in congestive abscesses and fistulas in that region, I would add: when they cannot be cured within a certain time, and the general condition is satisfactory, and the patient is free from any diathesis or dyscrasia. An abscess of course must not remain unopened. The fifth point should be extended as follows: and also in the absence of pain in the mastoid process, and in free discharge of the secretion, when in acute and chronic otitis media there is continuous though not high fever (38.2°–38.6°–39°), which does not yield after some time to local or general treatment.

As to the time when the operation shall be performed, the opinions of aurists are divided. Some advise to do it as early as possible, others not until threatening symptoms begin to manifest themselves. In the first years of my practice as an aurist I held to the latter view, not so much from conviction as from necessity. As the aural ward of the hospital at that time was a dependency of the surgical department, and the ideas of the significance and importance of aural diseases were erroneous and vague, and as I was entirely dependent upon the surgical department, it came about that the mastoid was only opened in desperate cases, and then only when pyæmia, septicæmia, meningitis, or encephalitis had existed for several days. Of course operations under such circumstances were rare and always unsuccessful; and consequently it was concluded that the operation was an unnecessary torture to the patient, who must die under all circumstances.

In the course of time I succeeded in overcoming the prejudice against opening of the mastoid process and in obtaining entire independence for the aural ward. Experience had taught me the uselessness of late operations, and convinced me of the advantages of early operative interference,

not only in cases for which the indications are laid down in the handbooks, but also in those which I have previously mentioned. From 1879 to 1885 I have opened the mastoid in six cases in the hospital, and twice in private practice. Of these eight cases, I lost seven. From 1885 to 1889, inclusive, I operated on forty-five cases, in twenty-nine at the hospital, and on sixteen in private practice. Among these forty-five cases, I only lost one, and he had a fully developed septico-pyæmia when he came under my care. Among these forty-five cases, there were eleven that were operated upon under indication number 7, and the extension of indication number 5, which I have proposed. In 1890 I have opened the mastoid process to the end of July in fourteen cases, in ten of them at the hospital, and in four in private practice; in four I operated under indications 7 and 5. Of these fourteen patients I lost three: one in my hospital practice, who came under my treatment on the sixth day in an advanced stage of meningitis and extensive caries of the tegmen (autopsy); one in private practice from œdema of the brain, which developed on the tenth day after the operation on a tuberculous person; and one, also in private practice, who had been healthy until his aural affection developed, and in whom caries of the mastoid process and the whole pars squamosa set in, after an injury (blow on the head) followed by purulent otitis media; the mastoid process was opened and the carious bone removed, exposing the dura mater to a large extent, but tuberculosis of the lungs rapidly developed, and the patient died.

The possibility of encountering unforeseen complications during the operation, among which opening of the transverse sinus was especially feared, and the fact that many cases recover without an operation, have probably been the reason why several aurists advised a late operation. Injury to the transverse sinus, which may occur in consequence of anatomical anomalies, is a rare event according to my view, and when it does occur, the result is generally not serious, as a glance at the reports of such cases shows. Among all the cases I have operated on myself (67), as well as those at which I assisted, this accident happened once, at the hospital.

But even in this case, injury of the transverse sinus in the strict meaning of the phrase did not take place, because in this patient there was a curious fistula at the upper margin of the mastoid process which led to the dura mater, and while I was carefully exploring the wound with a probe, a broad stream of black blood suddenly spurted forth. This case terminated favorably; in the first days there was high fever (40.9°), otherwise the course was normal. That the labyrinth may be injured in opening the mastoid process cannot be denied, but one must have been somewhat careless to reach it.

It is undoubtedly true that many cases recover without an operation, especially those which come under indication No. 7. This, however, does not justify long waiting, or, what is worse, the giving up of the operation. When we consider that in view of our exact knowledge of the anatomical conditions, exact execution, and, what is most important, our present methods of antiseptic bandaging, it cannot be considered dangerous; and, on the other hand, as it is impossible to disinfect the tympanic cavity thoroughly, as we are not always able to decide when a fatal complication begins to develop, and as such cases often end in death, either directly by causing general infection or acute cerebral trouble, or indirectly by becoming chronic and leading to caries, cachexia, tuberculosis, etc., the end of which is death. I believe that not only we must fully agree with Schwartze in operating as soon as possible, but also that we must extend the indications in the direction I have explained.

The most important reason which leads me to operate in indications 7 and 5 is the general surgical principle: where there is an accumulation of pus, and the conditions for evacuating it and keeping the cavity clean are unfavorable, we must endeavor to remove these obstacles, in order to bring about recovery and prevent complications. When, therefore, in acute purulent otitis media the suppuration does not cease, or even increases, or when moderate suppuration from the ear in acute and chronic otitis is attended with continuous moderate fever, it will be readily seen that in such cases the pus is not sufficiently discharged, or that

our remedies, applied through the tympanic cavity, do not reach the seat of the disease or do not act sufficiently. What else should then be done except to open the mastoid process? In this manner thorough disinfection of the tympanic cavity is made possible, and the removal of the products of disease is facilitated. I believe that the operation brings about not only a cessation of the affection of the mucous membrane, but also of the bony walls of the middle ear, which is freed from the pent-up pus.

In proof that the opening of the mastoid process, in cases in which I consider it indicated, is indeed called for, I will cite two clinical histories of patients whom in the last weeks I treated almost simultaneously :

(1) The Cossack Z. was attacked with croupous pneumonia, and after recovery from it, with severe purulent otitis media of the left ear, attended with high fever. The discharge was very profuse, the mastoid process not painful, its skin normal. The middle ear was syringed out daily with a weak solution of corrosive sublimate [1] through the external meatus and the Eustachian tube, and after a week the discharge had almost entirely ceased ; the high fever had subsided on the second day after the beginning of this treatment, and the general health of the patient rapidly improved. The syringing through the Eustachian tube was then discontinued, and I confined myself to disinfection of the ear through the external meatus. Ten days later the discharge suddenly increased without any known cause, the temperature rose to 39.5°, the general condition remained satisfactory, and nothing abnormal could be found about the mastoid process, either subjectively or objectively. The same treatment as before was instituted, and as I observed no improvement after two days, I decided to open the mastoid process the following day. But what a change occurred in these twenty-four hours ! I found the patient half-unconscious, mumbling to himself, and tossing about in bed almost constantly ; temperature 40°, pulse 120, rapid and feeble. Nevertheless, in spite of these pyæmic symptoms, I was ready to open the mastoid process, but after a consultation with the other physicians the patient was declared unfit for an operation, and

[1] I have used this solution of sublimate for three years instead of solutions of boracic acid, chloride of sodium, or bicarbonate of sodium. Since that time I have had no case of erysipelas in my ward, while formerly 3-5 cases annually were complicated with it.

transferred to the inner ward by order of the chief-of-staff. This patient died two days later, and the autopsy revealed the following: a fresh thrombus in the transverse sinus, infarcts in the lungs and in the spleen, and secondary meningitis of the convexity of the brain. In the middle ear and in the mastoid cells a large quantity of pus. The mastoid process hyperæmic.

(2) The artillery soldier L. came to my ward a week after the former patient, with very severe purulent otitis media of the left ear, which had begun four days previously without any known cause. The usual treatment, such as syringing through the Eustachian tube and the external auditory canal, instillations of a warm 4-per-cent. solution of boric acid, application of tincture of iodine to the mastoid process, failed to have the slightest effect upon the quantity of the discharge. This continued for two weeks; the general health of the patient was very good; there was not the slightest reaction on the part of the mastoid process. Suddenly the temperature rose to 41.2°, preceded by a severe chill. I at once proceeded to open the mastoid process. The cells were only found hyperæmic, and it was not until I had entered the antrum that I found a drop of pus. The wound was bandaged with iodoform gauze. The very same day the temperature fell to 36.5°, and remained at that point to the end of the disease. The suppuration ceased on the second day after the operation. The wound healed in six weeks, and the ear became entirely normal.

Under the indication of abscesses and fistulas in the region of the mastoid process, I have stated that in such cases the operation should be delayed. The only reason I can give for this is my own experience. I became convinced that spontaneous recovery takes place in many such cases without any injurious consequences. I have made the observation, and not even rarely, that fistulas upon the mastoid process, which penetrate into the bone affected with partial caries, may heal before it had been decided to remove the carious bone. Sometimes this takes place in a few days.

While I am of the opinion that the mastoid process should be opened as soon as possible and the indications be extended, I also believe that the operation is not contra-indicated when symptoms dangerous to life have developed.

Schwartze thinks that even when there are distinct septico-pyæmic symptoms the operation should be performed, as even at this stage recovery sometimes takes place—a statement which I can confirm from my own experience. I also became convinced that, even when distinct symptoms of cerebral inflammation have developed, the operation may still prove useful. Thus far I have observed but one such case, but it is sufficiently instructive to prove that even in such cases the patient should not be left to his fate, and that they form a special indication for opening the mastoid process. On account of its importance, I will briefly give the clinical history.

The dragoon J. P., aged twenty-five, came to my ward with an acute purulent otitis media of the left ear, severe left-sided headache, and high fever (39.7°). Three days later the temperature rose to 40.7°, the pulse was hard and full, 84 beats a minute. On the fourth day the headache was almost unbearable, the patient groaned continually, tossed about in bed, and showed marked psychic depression after a few hours. All this time the left side of the head was sensitive to percussion, the mastoid process painful on pressure, the discharge from the ear purulent, of moderate quantity. The same day there was found unequal size of the pupils and slight reaction to light, constipation, nausea, sometimes vomiting, and great dizziness. The patient could neither stand nor sit ; he felt as though he were to fall from the left side of the bed, or that it were turned to the left, and as though the head were lower than the feet. On the fifth day the following additional symptoms appeared : stiffness of the neck, contraction of the extremities, and complete unconsciousness, with coma. The treatment during these five days consisted in disinfection and application of the air-douche ; upon the head, upon the left side of which sublimate salve was rubbed several times, there was always an ice-bag; leeches and a vesicant were applied to the mastoid process and Wilde's incision was performed; internally calomel with jalappa, afterwards infus. sennæ compos., were given; but all these remedies failed to affect the course of the disease in the slightest. As in this case there could be no doubt of the diagnosis of meningitis, I considered it useless to open the mastoid process and thought the patient doomed. The chief-of-staff, however, urged me to do the operation, as there was nothing

to lose, and so I performed it the same day. The mastoid process proved sclerosed in its entire thickness; when therefore I had penetrated to a depth of almost 2 *cm* and had neither reached the antrum nor found a trace of pus, I desisted, filled the wound with iodoform-gauze, and applied the usual sublimate bandage. The operation was performed almost entirely without chloroform, the comatose patient being entirely indifferent to our proceedings. A few hours after the operation the temperature had fallen to 38.1°; pulse, 120. On the second day consciousness began to return and the intensity of the other symptoms to abate. On the eighth day he could sit up in bed for fifteen minutes, and on the seventeenth even walk about in the room. The wound healed in nine weeks. There was no fever whatever. The discharge from the ear, which had ceased for two days after the operation, returned and could not be checked. The perforation in the membrana tympani also remained unaltered.

The operation in this case must have acted merely by depleting the cerebral blood-vessels; upon the suppuration in the ear it had neither a direct effect, because we did not reach the source of the pus, nor an indirect one, as the subsequent continuous discharge from the ear proves. There can be no doubt however that it saved the patient's life.

Throughout Europe the mastoid process is opened with the hammer and chisel. I also operate principally in the same manner, and until lately only with the chisel, as this method is the least dangerous, the wound remains clean during the operation, and can easily be kept under observation. A few months ago the surgical department of the hospital received a trephine à crémaillère for operations on the bone. It is precisely the same trephine which Pasteur uses in his investigations on animals. I was advised to use the instrument for opening the mastoid process. I have done so twice, and once the operation was done by the consultant of the surgical department. No conclusions can be drawn from these three operations, and I shall therefore confine myself to giving the impressions which this method of operating made upon me: 1. The removal of the compact portion of the mastoid process, especially when it is thick, is much more rapid than with the mallet. 2. The

edges of the wound need not be smoothed off after the operation. 3. The different size of the trephines permits the formation of a wound in the bone of the desired size. 4. Shock, which can be avoided with the hammer only to a certain extent, is entirely obviated with the trephine. 5. The depth of the wound can be graduated with exactness. An inconvenience however lies in the fact that the wound can only be inspected when the trephined piece of bone has been lifted out, which in sclerosed bone may not be easy. For operating in the mastoid cells the sharp spoon is sufficient. The true value of this method of operation can only be arrived at from a large number of them, performed by various surgeons.[1] I believe that in opening the cranial cavity for the evacuation of cranial abscesses the trephine is even to be preferred to the broad chisel, as in removing a large piece of bone with the latter instrument we must operate long with it, so that the shock must be quite severe, which with the trephine is not the case, even when applied at several adjacent spots.

[1] Another series of openings of the mastoid process seems to argue more in favor of the hammer and chisel.

A CONTRIBUTION TO THE HISTOLOGY OF AURAL POLYPI.

By C. KLINGEL, of Heidelberg.

Translated by Casey A. Wood, of Chicago.

I AM under deep obligations to my honored teacher, Professor Moos, for the encouragement and the opportunity he has so kindly given me to examine microscopically the following fifteen cases of aural polypi removed from patients attending the University Ear Clinic:

I.—FIBROMA MYXOMATODES.

F. B., æt. thirty-two. Left ear. Suffered for fifteen or sixteen years with earache, headache, occasional vomiting, otorrhœa, and difficulty of hearing. Seventeen years ago had a polypus removed. Patient now complains of tinnitus, vertigo, and vomiting, the latter coming on every three or four days.

The polypus was snared May 21, 1887. It projected from the tympanic cavity, although at first it presented the appearance of being attached to the handle of the malleus. Later treatment with the galvano-cautery revealed the fact that a portion of it lay within the middle ear. The treatment was first plumbic acetate (1:5), then the galvano-cautery, and finally absolute alcohol. Patient discharged cured Aug. 20, 1887. No relapse.

External appearance.—Club-like in shape; about 2 *cm* long and 1 *cm* broad: it has on one side, near its base, numerous small lobules.

Structure.—The tumor is principally composed of mucoid areolar tissue. Ramifying throughout this mass in every direction are extremely fine fibres which interlace and form a delicate network. The cells, some round, some spindle-shaped, some stellate,

are variously arranged. The blood-vessels are few in number, and in their immediate neighborhood the round cells are more thickly disposed, *i. e.*, granulation tissue. Portions of the periphery and each lobule contain recently formed connective tissue crowded with cells and vessels ; granulation tissue. There are two kinds of epithelium : lying deep between the lobuli is a stratum of cylindrical epithelium, while the peripheral portions show a thin epidermoid layer. Here and there the rete Malpighii sends processes into the substance of the polypus.

II.—GRANULATION TUMOR.

J. M., æt. twenty-two, had for three years a bilateral *otitis media chronica.* On the right side a polypus springing from the wall of the labyrinth ; with it occasional pains and difficulty of hearing. Left side, above and behind, a perforation through which the long process of the incus can be seen. The treatment consisted at first of insufflations (both sides) of boric acid ; on the right, alcohol. June 11, 1887, the polypus was removed with the cold snare, followed by the alum tampon until June 14th. The right ear was then treated with alcohol and especially with the galvano-cautery until June 30th. The left ear was cured by the boric-acid treatment. No relapse.

External appearance.—Small tumor, about the shape of a three-sided pyramid, and 5 *mm* high.

Structure.—Numerous round cells in a delicate reticulum. Many vessels. Scattered patches of myxomatous tissue. Blood extravasations with pigmentary changes. No epithelium.

III.—FIBROMA MYXOMATODES.

L. Lt., æt. six, has suffered for four years with chronic middle-ear suppuration, with formation of polypi. Earache, otorrhœa, and difficulty of hearing. The history also shows that when four weeks old the patient had had an inflammation of the ear, following an attack of whooping-cough. An examination (June 7, 1887) reveals the presence of two polypi in the tympanic cavity attached to the labyrinth wall.

One polypus was (June 16th) removed by means of the cold snare. Cotton-wool tampon and alcohol absol. Patient used at home instillations of plumbic acetate 4:40.

The second tumor was extracted in the same way. Alum tampon and at home the same lead application. Dismissed July 28th, cured. No relapse.

External appearance.—Length about 1½–2 *cm*; 1 *cm* wide. Club-shaped, with lobuli at the base.

Structure.—Chiefly myxomatous. Isolated blood-vessels. At the surface more richly formed connective tissue rich in round cells. In the lobules also granulation tissue and numerous vessels. Two kinds of epithelium. The interlobular portions as well as the inferior sections of the main tumor contain a layer of cylindrical epithelium. The free end of the tumor is clothed with epidermis. In addition to this there are various gland-like, epithelial processes covered with cylinder-epithelium.

IV.—GRANULATION TUMOR AND ANGIOFIBROMA.

J. R. has had for five weeks a purulent otitis media with formation of polypi. Also an affection of the mastoid process and post-nasal adenoid vegetations. Pains said to have set in four weeks before. Removal of a polypus and mastoid incision. Jan. 28, 1888, mastoid operation and extraction through the external meatus of a polypus by means of the cold snare. The polypus was attached to the border of a fistulous opening in the posterior wall of the bony meatus which communicated with the mastoid cells. Disinfectant injections were continued until Feb. 12th.

Recurrent polypi were treated with absolute alcohol and the galvano-cautery—unsuccessfully. On June 9th the pain had returned with copious suppuration. Facial paresis [probably due to caries or retention of pus (?)] also set in. Several granulations were on this date removed under general anæsthesia. This was followed by a permanent cure and by the disappearance of the paralysis.

External appearance.—Small tumors not larger than peas with tuberculated surfaces.

Structure.—In one preparation (*a*) recent, multicellular connective tissue. In its centre a hemorrhage. Isolated bands of areolar tissue with parallel fibres and rich in cells. Within the blood-clot vascular formations and cells partly arranged in rows.

In the second (*b*) preparation the neoplastic cellular tissue possesses an angio-fibromatous character. In both preparations epidermis can be seen sending processes (Zapfen) deep into the substance of the growth.

V.—FIBROMA MYXOMATODES.

A. B., æt. thirty-two, had a right-sided *otitis media purulenta* for several years. A polypus said to have been removed in 1871 at

Freiburg. On Feb. 21, 1888, found a large tumor attached to the wall of the labyrinth. Feb. 23d, polypus removed with cold snare. Alum tampon. Further treatment: absolute alcohol and repeated galvano-cauterizations until April 14th. Then absolute alcohol alternating with plumbic acetate (1:10) and galvano-cautery. Discharged June 2, 1888, with cicatrix covering the whole promontory.

External appearance.—1½ *cm* long and 1 *cm* wide. Club-like shape with smaller lobules.

Structure.—Myxomatous tissue. In the periphery and in the lobuli new-formed areolar tissue. Vessels are few but rather more numerous in the periphery. On one side is a dilated blood-vessel. A single layer of cylindrical epithelium covers the largest part of the tumor—the minute tubercles. Epidermis on the portion exposed to the external air.

At the periphery there are several cavities invested partly with cylindrical and in part with flattened epithelium. In the same locality are gland-like depressions to be seen. The cavities contain a finely granular, structureless mass with here and there a desquamated epithelial cell. There are no glandular elements.

VI.—FIBROMA MYXOMATODES.

L. G., æt. forty-four. *Otitis med. purulenta chronica* for three years, with double-polypus growths attached to the labyrinth wall on the left side. Severe pains.

One polypus removed by the cold snare, May 1, 1888, after which a quantity of partially inspissated pus escaped. Alum tampon. On May 5th a left facial paresis appeared. After syringing, another tumor was seen, which was treated with absolute alcohol until June 23d. Complete cure, including the facial paralysis, without relapse. Central perforation remained.

External appearance.—Length, 2 *cm;* breadth, 1 *cm.* Smooth surface; no tuberosities.

Structure.—Myxomatous tissue extremely rich in cells, vascular throughout, and permeated by recently formed areolar tissue. Many spots are of a decidedly angio-fibromatous character. Only one comparatively small area is covered with epidermis which sends out slender offshoots into the substance of the tumor. With this exception, the epithelium appears to have been accidentally stripped from the specimen.

VII.—FIBROMA MYXOMATODES.

J. B., æt. nine, had a right-sided deafness for a long time, and several years ago pains and otorrhœa. Then an intermission. For fourteen days past a renewal of the pain and discharge. An examination (Nov. 9, 1888) discovers a polypus that completely fills the lower end of the meatus. Only an upper segment of the drumhead is visible. A probe can be passed above, behind, and below the polypus, which springs from the labyrinthine wall. Posterior half of membrana tympani wanting. Operation with cold snare, Nov. 10th, was followed by an attack of syncope. In the night (Nov. 11th–12th) headache, feverishness, restlessness, vomiting. Temperature 39.2°. Evening temperature, Nov. 12th, 40.2°; pains on back of head and general malaise. Pupils normal. Nausea Nov. 16th. Temp. normal and much purulent discharge. Vertigo on 27th November. Further treatment consisted of boracic acid until patient was discharged on Feb. 28th. Ear dry and perforation closed. No relapse.

External appearance.—About 1 *cm* long, ½ *cm* wide. Numerous obules.

Structure.—Central portion myxomatous; at the periphery and in the lobules recent connective tissue. Not many blood-vessels; some of them are dilated. Sometimes the layer of cylindrical epithelium is plainly separable from the underlying tissue, sometimes it is not.

VIII.—FIBROMA MYXOMATODES.

S. K., æt. ten, had from early infancy otorrhœa and difficulty of hearing. Examined Jan. 10, 1889, when a large growth was observed projecting into the external meatus. On Jan. 14th a piece of the tumor is said to have become detached spontaneously.

On Jan. 15th patient was anæsthetized and a large polypus, protruding from the tympanic cavity, was removed with the cold snare. Alum tampon. Absolute alcohol was also prescribed for a second tumor, whose point of attachment it was impossible to ascertain since the sound could not be used owing to the restlessness of the patient. The polypus operated upon had its origin in the region of the stapes. After removal patient left the clinic.

External appearance.—Length 1–1½ *cm*, and consisting of several lobules.

Structure.—Central portion myxomatous areolar tissue; also isolated connective-tissue bands composed of parallel fibres. In the peripheral portions connective tissue of recent growth and crowded with cells. Numerous vessels.

Very thick epidermis which sends thick, branching processes into the substance of the tumor. In one situation such an offshoot has split at its centre into two portions.

IX.—FIBROMA MYXOMATODES.

E. W., æt. eleven. Right-sided *med. pur. chron.* With mastoid affection and formation of polypi. Adenoid growths in post-nasal space. The affection said to have lasted a year, with otorrhœa and difficulty of hearing. Had, a year ago, gastric fever of ten weeks' duration. For the past four or five weeks swelling of the right mastoid process. An incision made three weeks ago gave exit to very little pus.

The removal (February 23, 1889) of the polypus, which sprang from the posterior wall of the bony meatus, was followed by operation on the mastoid. The stump of the polypus was burned with the electro-cautery and boric acid insufflated. The purulent discharge from the mastoid continued until the 11th of March, when the adenoid vegetations were removed and the remains of the polypi were again treated by the electro-cautery. As a result of this additional portions came away. Discharged April 9th.

External appearance.—Lobulated tumor 2 *cm* long and 1 *cm* wide.

Structure.—Internally multicellular myxomatous tissue surrounded by recent areolar tissue. Few vessels in the former, more in the latter.

The tumor is partially covered by thin epidermis, and in the offshoots before referred to there is some cylindrical epithelium.

X.—ANGIO-FIBROMA.

G. L., æt. twenty-eight, a phthisical subject, had on the left side a purulent middle-ear inflammation, central perforation, and for nine months suffered from occasional pains, otorrhœa, and difficulty of hearing. Four or five weeks ago a circumscribed otitis externa set in.

Polypus operated on March 21, 1889. The tumor was attached to the posterior wall of the bony meatus. Alum tampon. March 23d, a second piece removed, and still another March 28th. The

rest of the treatment consisted of the galvano-cautery and instillations of absolute alcohol. Subsequently the patient did not return.

Only one specimen was examined.

External appearance. — Flattened tumor (composed of two lobes) about 1 *cm* long, 1 *cm* wide, and 5 *mm* thick.

Structure.—Angio-fibromatous tissue. In some situations vascular new growths, *i. e.*, cell cords (*Zellstränge*), between two vessels.

The tumor is clothed with epidermis, which sends into the substance of the polypus broad processes with manifold ramifications that often have bulbous terminals.

XI.—FIBROMA MYXOMATODES.

K. S., æt. thirty-four. For seven to eight weeks nasal catarrh and tinnitus aurium. On the right side for five weeks pain, otorrhœa, and deafness.

April 4, 1889, warm water ordered for hardened secretion, which consists of inspissated pus and cholesteatomatous masses. April 11th, a polypus, which sprang from the posterior-superior wall of the bony meatus, was removed with the snare. Alum tampon ; afterwards galvano-cautery. Discharged (May 28th) cured, and no relapse.

External appearance.—A small lobule with a narrow pedicle and about the size of a pea.

Structure.—The growth consists of mucous tissue ; the pedicle in part of new connective tissue rich in cells, in part of fibrous tissue. A good many engorged capillaries, which are partially dilated.

Epidermal covering of varying thickness. In isolated depressions cylinder epithelium.

XII.—FIBROMA MYXOMATODES.

F. S., æt. eleven. Left side, otorrhœa and difficulty of hearing for two years. July 30, 1889, removal by snare of a large polypus attached to the labyrinthine wall. Alum tampon. Later, absolute alcohol and galvano-cautery. Discharged, January 18, 1890, cured. No relapse.

External appearance.—2 to 2½ *cm* long, narrow pedicle and bulbous end. Also a thin tapering excrescence.

Structure.—The pedicle is partly formed of myxomatous tissue, in portions of whose lobules is new-formed areolar tissue full of

cells. At the junction of the pedicle with the larger tubercles are parallel, undulating connective-tissue fibres with spindle-shaped cells. These, as well as mucous tissue, are also found in the tubercles themselves.

Epidermis covers the larger lobules, and in detached depressions are single layers of cylindrical epithelium. The pedicle, with its lobules and depressions, is also covered with cylinder epithelium.

XIII.—GRANULATION TUMOR.

M. E., æt. thirty-nine. Eight weeks ago severe pain on right side lasting eight or ten days. Swelling in external meatus, and otorrhœa. On January 30, 1890, removal of a polyp (attached to the wall of the labyrinth) by means of the cold snare. Alum tampon. Further treatment, galvano-cautery and alum. Discharged, February 8th, as cured.

External appearance.—Semicircular piece 7 *mm* long, 2 to 3 *mm* wide.

Structure.—Entirely composed of granulation tissue with numerous blood-vessels. Some of these are obstructed through growth of the adventitia. No epithelium present.

XIV.—ANGIO-FIBROMA MYXOMATODES.

N. B., æt. forty-seven laborer. Since childhood, left-sided otorrhœa. For six months has had a tumor in left ear. A polypus with attachment to the wall of the labyrinth removed by cold snare. Subsequent syringing dislodged masses of cholesteatoma. Repeated applications (until February 25th) of galvano-cautery to the stump. Polypus has completely disappeared but patient is still under treatment for the discharge.

External appearance.—Length 3 *cm.* A number of long, narrow, pedunculated lobules.

Structure.—Chiefly newly-formed areolar tissue often presenting an angiomatous character, intermingled with myxomatous portions. Numerous dilated vessels.

The tumor is invested by a single layer of cylindrical epithelium. On the parts exposed to the external air the epithelium has a greater resemblance to the epidermis.

XV.—GRANULATION TUMOR.

M. B., æt. fifty-six. Right side, occasional pain for two years, and otorrhœa. The disease began with tinnitus, and then the

discharge set in. On February 3, 1890, a fairly large tumor was noticed projecting into the external meatus. As was proved on removal (February 4th), it was attached to the middle of the labyrinth wall. Alum tampon. February 5th pedicle touched with electro-cautery. Further treated with alcohol and galvano-cautery. Discharged cured February 24th.

Only a small portion available for examination.

Structure.—Granulation tissue. Here and there myxomatous as well as angiomatous portions. No epithelium.

REMARKS.

A purulent otitis was the cause of the polypi in all of the foregoing fifteen cases, just as the majority of polypi are developed in the case of chronic (more rarely acute) middle-ear suppuration and primary inflammation of the external auditory meatus.

Of 100 polypi described by Moos and Steinbrügge,[1] 68 were the result of purulent inflammation of the middle ear, and 25 of the meatus externus. Weydener[2] has described 73 aural polypi. Of these 69 depended upon *otitis media purulenta*, while 4 were associated with affections of the external meatus. In only one of the specimens examined by me—a child—was pertussis set down as a cause. In the histories of the remaining cases little or nothing is said about the co-existence of other infectious diseases. There can be no doubt but that a more thorough inquiry would have revealed the presence of a larger number of these. Moos and Steinbrügge, for example, thought sixteen of their cases to be due to infection, and believed that number to be too small.

Regarding the *structure* of the specimens there are principally three kinds of tissue to consider, viz., myxo-fibromatous, angio-fibromatous, and granulation tissue. When, in describing these polypi, I have referred to one or other of them as a myxo-fibroma, angio-fibroma, etc., it must not be concluded that in a particular specimen only this or that formation had been found. On the contrary, all these new growths quite frequently existed side by side in the same

[1] THESE ARCHIVES, vol. xi., p. 328.
[2] THESE ARCHIVES, vol. xiv., p. 49,

tumor, and the neoplasm took its name from the tissue or tissues that were best represented in it. I have chosen the names myxo-fibroma and myxo-fibromatous tissue because that structure, a sort of connective tissue, bears a close resemblance to mucous tissue.

Steudener[1] distinguishes three principal types: (*a*) the ordinary mucous polypus, (*b*) the more compact connective-tissue growths (fibroma), and (*c*) myxoma. Moos and Steinbrügge observed four different kinds: granulation tumors, angio-fibroma,[2] fibroma, and myxoma. Kiesselbach adds another class, "mucous polypi"—fibroma with an areolar structure and interstitial material containing mucin.[3]

It is characteristic of *myxo-fibromatous* tissue that the intercellular substance of its areolar tissue is composed of delicate reticulated filaments. In this interstitial material lie cells of various shapes and complex ramifications—round, oblong, spindle-shaped, stellate. The cells are not found in compact masses, but in smaller or larger interstices. It is practically the same tissue that Kessel[4] has so fully described, and which he found in almost all the polypi examined by him. Kessel regards this tissue—whose structural peculiarities are more strongly marked than almost any other connective-tissue formation—as saturated by serous fluid and œdematous, in much the same way as are the majority of the nasal mucous polypi described, later on, by Hopmann. Steudener has also examined this tissue, and found that the interstitial substance, which in the fresh state appears to be entirely homogeneous, becomes finely granular on the addition of acetic acid. In Steudener's cases it also contained mucin.

In polypi containing this tissue the cells noticeably increase in number towards the periphery, and in that situation pure granulation tissue is met with.

There is nothing remarkable about the *granulation tissue;* it exhibits the usual structural peculiarities.

The *angio-fibromatous* tissue resembles granulation tissue

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[1] *Arch. f. Ohrenheilk.*, Bd. iv., 1869.
[2] *Monatschr. f. Ohrenheilk.*, 1887, No. 4.
[3] There still remain the rare cases—pure vascular growths (angiomata)—described by Buck and Moos as arising from the handle of the malleus.
[4] *Arch. f. Ohrenheilk.*, Bd. iv., 1869.

in containing masses of round cells, but, unlike the latter, they are not regularly arranged within an interstitial reticulum, but are more closely connected with the masses of newly formed vessels. This recent areolar tissue, as it may properly be called, originates from the walls of the vessels themselves, since there is an increased growth not only of the elements of the adventitia, but of the intima as well. In consequence of such an hypertrophy of the cells of the intima, the lumen of the blood-vessels may be so completely obliterated that the latter becomes a mere cord of connective tissue studded with cells. The tissue resulting from the increase in the adventitious elements, consists of cells which arrange themselves concentrically about the vessel.

Both in granulation tissue as well as in angio-fibromata, one finds rows of cells that stretch from one vessel to another. These are to be regarded as new vessels in the first stage of development.

This angio-fibrous tissue is also described by Moos and Steinbrügge, as considered by well-known observers to be a chronic alteration leading to the obliteration of the blood-vessels, and in consequence to the formation of all anæmic and compact fibrous tissue.

Isolated bands of true connective tissue containing a few spindle-shaped cells and intercellular material, with parallel fibres, were found in the specimens. This was best seen about the pedicles and in isolated patches. Meissner also mentions it.

Kessel has also described a formation which exhibited connective tissue in one small locality only, and was with this exception composed of blood corpuscles and vessels. From the areolar tissue broad bands stretched into the body of the growth. This formation Kessel regarded as an organized blood-clot and compared it with the so-called "fibrinous blood polypus" of the uterus. I have noticed something like this in various specimens, especially in Case 4, (*a*), where on one side of the tumor is a large blood extravasation. In it there are bands composed of cells with interstitial fibrous material and evidence of vascular formations. It is not possible to decide whether this condition results from the

organization of a blood-clot or from the tissue having been merely disintegrated by the extravasated blood-clot.

The *epithelium* of the polypi in view of its interesting character, demands our attention. In short, the examined specimens present (1) well-formed epidermis, (2) true cylindrical (ciliated) epithelium, (3) intermediate forms, *i. e.*, gradations from single layers of cylindrical epithelium to stratified pavement epithelium; the former first becomes stratified and then the upper cells assume at one time a polygonal at another a flattened form.

The cylindrical epithelium is, as a rule, disposed in a single layer and is best seen in the grooves between the minute lobules of the polypus. Here can be seen parallel and adjacent cylindrical cells with large, readily stained nuclei. The nucleus, in which distinct nucleoli are often to be seen, always lies more on the basal portion of the cell, where, too, the cellular protoplasm is nearly always more deeply stained. Unfortunately I cannot make out in my preparations the presence of the cilia seen by other observers in aural polypi. It is certain that they can be seen only in recent specimens. Yet I believe that I have observed traces of them in several situations.

The border line which separates the single layer of columnar epithelium from the underlying areolar tissue is, as a rule, sharply defined. There are, however, exceptions to this, as when certain cells have a tapering point directed downwards or often project long processes into the vascular, multicellular connective tissue lying immediately beneath them. Unlike Kessel I have not observed a direct connection between these epithelial processes and the walls of the vessels.

The *epidermis* was found to be of varying thickness in the different tumors. It sends projections into the tissues beneath, which are sometimes delicate, but are occasionally of large size and extend quite through the whole growth. According to Moos and Steinbrügge, such an epithelial band traversing the tumor may divide at the middle and be the cause of separating the growth into two parts.

In very many specimens, both forms of epithelium (with

gradations between them) lie side by side. The columnar epithelium is found in the deeper portions between the lobules, whence there is an easy transition to the outer portions exposed to the external air.

On the surface also are delicate, gland-like depressions covered with cylindrical epithelium, where epidermis is commonly found. According to Kessel the columnar epithelium in this locality owes its presence to the fact that the orignal rete Malpighii had been removed by the œdema of the parts, and only the lowest layers remained and took on the columnar form. This view is supported by Weydener, while Kiesselbach announces the theory that in these cases the proliferating cylindrical epithelium of the tympanic cavity has been changed into epidermis through the influence of the external air. I entirely agree with this opinion of Kiesselbach. In all human neoplasms where epithelium is found the latter has, to begin with, the character of the parent tissue until it is altered by the force of external influences. In polypi which have their origin in the external meatus one finds the pavement epithelium proper to that situation. In the tympanic cavity both kinds of epithelium are present; in the inferior portions near the opening of the Eustachian tube ciliated epithelium, in the upper segment pavement epithelium. It is, therefore, possible that a polypus arising from the cavity of the tympanum may possess either pavement or columnar epithelium, according to the particular locality from which it springs. Epithelium of the cylindrical cavity may subsequently be transformed by exposure to the outside air into (epidermis) pavement epithelium. Finally, there is also the possibility of the mucous lining of the tympanic cavity assuming the characteristics of epidermis in consequence of long-continued inflammation; for the same reason when polypi undergo a transformation they may also become invested with an epidermic covering.

Kiesselbach has observed both varieties of epithelium in polypi attached to the inner termination of the meatus externus. These were not separated at their borders by the usual intermediate forms, but ran directly into one another. He did not conclude from this that one form had suddenly

changed into the other, but that the polypi themselves had had an origin from a locality where both varieties of epithelia existed side by side. In my opinion Cases ix. and xi. belong to this category.

I observed cavities clothed with epithelium in one instance only—in No. v. They were found in one side of the tumor, directly under the surface, in the neighborhood of minute fissures situated between diminutive lobular formations. These were regarded as retention cysts (Steudener) from obstructed glands. However, in none of the examined polypi were there true glands. It is true that these epithelial depressions frequently resemble glands, but they are either cavities between two lobules of the tumor or are the result of a splitting of the epithelial band itself. Others thought that the free ends of some of the lobules growing together, the fissure between them being shut in and the secretions continually being given off from the enclosed surfaces no longer escaping, the fissure became dilated into a cavity. I concur in this opinion so far as regards the case observed by me, because in the neighborhood of the cyst such a fissure could be seen, but not a single gland.

Blood-vessels are present in the myxomatous tissue to a comparatively slight extent. They have invariably the character of capillaries, and their adventitia and intima can be plainly made out. These are separated by a space more or less broad—the perivascular lymph-space of His.

Sometimes evidences of proliferation are present in the cells of both the intima and adventitia, which indicate the formative massing of round cells. These recently formed cellular bodies are often arranged in rows as if they were the forerunners of new blood-vessels.

Regarding the relations of the vessels in the angio-fibromatous tumors, consult the foregoing. Not infrequently these were dilated, especially in the neighborhood of the pedicle of the growth.

The *growth* of aural polypi appears to take place in the separate lobules and particularly at the surface. The basal tissue is usually denser, poor in cells, and appears to cease to develop. Growth takes place chiefly in the recent, many-

celled areolar tissue—in the granulation tissue,—which in our cases was found in the periphery of the tumors. The neighborhood of the vessels in the interior of the growth consists of granulation tissue, and it is by no means disproved that these are not the beginnings of vascular and other new formations.

According to Weydener almost all polypi are originally granulation-tissue tumors whose final stage is a complete change into connective tissue. In acute or chronic purulent middle-ear inflammation, along with ulcerative processes, there goes hypertrophy of the mucous lining of the tympanic cavity. Granulations now form and continue to increase in size and number until they develop into areolar or mucous tissue.

Finally, in regard to *retrograde changes* I have seen, in addition to some hemorrhages and pigment formations, small vitreous spots, which gave me the impression of amyloid degeneration. Meissner mentions cystic degeneration, fatty metamorphosis, and molecular disintegration, corpora amylacea, and the formation of colloid substance in the cysts. Moos and Steinbrügge especially mention, as histological conditions, (1) blood extravasations and their pigmentary changes; (2) bony new-formations; (3) central necrosis, and (4) cyst formations. In addition to these he reports central cholesteatoma formations. I myself observed in only one case—No. xiv.—that immediately after syringing out the ear a whitish mass, shining like mother-of-pearl, was extruded.

A microscopical examination showed an epithelial structure with indications of nuclei.

Kiesselbach mentions cases that closely resemble the one with central cholesteatoma described by Moos and Steinbrügge, and might easily be mistaken for it. These referred to sections which had so struck the columnar epithelium that only their terminations without nuclei were visible.

REPORT ON THE PROGRESS OF OTOLOGY DURING THE FIRST HALF OF THE YEAR 1890.

By Prof. AD. BARTH, Marburg.

Translated by Dr. Max Toeplitz, New York.

NORMAL AND PATHOLOGICAL, ANATOMY, HISTOLOGY, AND PHYSIOLOGY OF THE EAR AND NASO-PHARYNX.

I.—ANATOMY.

a.—HEARING ORGAN.

1. Rohrer, F., Zurich. The bacteria of cerumen. Lecture delivered at the International Congress of Otologists and Laryngologists at Paris, September, 1889. *Arch. f. Ohrenheilk.*, vol. xxix., p. 44.

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3. Sutton, J. B. Supernumerary auricles. *Illustr. Med. News*, London 1889, vol. iv., p. 52.

4. Ranke, Prof. H. Case of malformation of the ear. *Sitzungsber. d. Ges. f. Morphol. u. Physiol. in Munich*, No. 2, 1889, p. 68.

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5*a*. Eve and Bidwell. Supernumerary auricle in the neck. *The Lancet*, Nov. 16, 1890.

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relation to allied branchiogenous malformations. III. (From the I. Anat. Instit. at Berlin.) *Virchow's Arch.*, vol. cxxi., pp. 55 and 247.

7. RUMLER, Assistant to the aural policlinic of the University of Bonn. Contribution to the knowledge of regeneration and cicatrization of the membrana tympani. With one plate. *Arch. f. Ohrenheilk.*, vol. xxx., p. 142.

8. KILLIAN, G., Private lecturer. The aural muscles of the crocodile, together with preliminary remarks upon the homology of the stapedial muscle and the stapes. (From the Anatom. Instit. at Freiburg-i.-Br.) With one plate. *Jenaische Zeitschr. f. Naturwissensch.*, vol. xxiv., neue Folge xvii., p. 632.

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12. KIRCHNER, W. Würzburg. Extravasation into the nervous sheath of the chorda tympani in diphtheria of the tympanic cavity. (From the aural clinic of the university.) *Centralbl. d. Allgem. Pathol. u. Patholog. Anat.*, 1890, vol. i., p. 1.

13. HABERMANN, I. Additional contribution to the knowledge of the development of cholesteatoma in the middle ear. (From Professor Chiari's pathol. anat. institute at the German university at Prague.) *Zeitschr. f. Heilkh.*, vol. xi., p. 89.

14. RANDALL, B. A. Cholesteatoma of the ear. *Jour. Amer .Med. Asso.*, 6th September, 1890.

15. POLITZER, Prof. A. Histological investigations upon the pathological changes in the niches of the oval and round windows which take place in the affections of the mucous membrane of the tympanum. (Recherches histologiques sur les changements patologiques dans les niches et de la fénêtre ovale et de la fénêtre ronde qui se produisent dans les affections de la muqueuse de la caisse du tympan.) With three plates. Brussels, 1889. (Lecture delivered at the International Congress, 1888.)

16. MYGIND, HOLGER, Copenhagen. Review of the pathologicoanatomical changes in the ear of deaf-mutes, based upon a number of post-mortem examinations. *Arch. f. Ohrenheilk.*, vol. xxx., p. 76.

17. KRAUSE, RUDOLPH. Embryology of the membranous semicircular canals. With one plate and six zincotypes. (From the II. Anat. Instit. at Berlin.) *Arch. f. Microsc. Anat.*, 1890, vol. xxxv., p. 287.

18. GRADENIGO, Turin. Contribution to the knowledge of neuritis acustica caused by meningitis. (Contribuzione alla conseguenza della nevrite dell' acustico da meningite.) *Arch. Internat. de Laryng*, etc., 1890.

19. FLECHSIG, Prof. P., Leipsic. Further communications upon the relation of the lower corpus quadrigeminum to the auditory nerve. *Neurol. Centralbl.*, 1890, p. 98.

20. GOWERS, W. R., London The function of the cerebellum. *Ibidem*, 1890, No. 7.

21. FERRIER, DAVID. On cerebral localization. The Croonian lectures at the Royal College of Physicians. *Lancet*, June, 1890.

1. ROHRER found in the cultures made from fifty cases of ceruminal plugs different bacilli, cocci, diplococci, and staphylococci. When injected into animals, in a great number of cases, changes were found in the liver, lungs, retroperitoneal, and mesenteric glands, but no tuberculosis. The author came to the conclusion that a large number of bacteria exist in the cerumen and may develop from it in proper nutrient soil ; furthermore that besides a majority of saprophytic species, several forms of which were suspected of being pathogenic, were repeatedly found, and finally that schizomycetes may survive in the cerumen.

2. The investigations were made in order to explain by anatomical facts the temporary deafness of the mountain cock during the breeding time. It is improbable that it is produced by an occlusion of the auditory meatus by means of an osseous projection of the opened lower maxilla. On the contrary, it should be supposed that, as in other birds, the so-called "swelling-fold" upon the posterior wall of the external auditory meatus communicates with the pneumatic cavities situated farther backward and swells so much by inflation as to occlude the meatus. Besides SCHWALBE found in the "auditory tubercle" tubular, genuinely epithelial glands and another more sac-like form, which in their structure resemble more the sudoriferous glands.

4. The author first demonstrates a specimen in which the auricle was situated too far toward the mouth, and the meatus ended in a blind tube. Contrary to the view held during life, the tympanic cavity was entirely absent. The tube was rudimentary, and also ended blind. A child at seven was then presented. The auricles were rudimentary, the meatuses were absent. Despite fair hearing and speech, the desired operation revealed the fact that also here on both sides the parts developing from the first branchial fissure were not present, or at least in a faulty condition, while the function of the labyrinth was not impaired.

5*a*. EVE and BIDWELL describe and figure a very interesting case of a curious deformity. The supernumerary auricle was in the form of a nipple-like projection half an inch long, situated over the middle of the anterior border of the left sterno-mastoid. The projection itself contained a rod of cartilage prolonged from a thin plate, the size and shape of an ear, situated in the tissues below ; on dissection this plate was found to consist of osseous material in the form of a bar (antihelix) and plate (lobule).

6. The authors describe the following structures : the branchial structures, cysts of secondary formation, genuine tumors, and complete teratomata. They were followed by congenital cutaneous growths in the aural region and upon the neck. They were considered as a heterotypical reproduction of the parts from which the auricle develops. The fistula auris congenita bears no relation to the primary aural fissure, since it is situated in front of the crus helicis, which is never reached by the fossa auricularis. In accordance with His, a sulcus in this place can arise only by insufficient connection of the sulcus between the crus helicis and crus supratragicum.

7. RUMLER experimented upon rabbits with the following result : (*a*) The outer epithelium, which exhibits an increase of cells after the first six hours, first takes part in the healing process of the defect, and for the most part during the first three days. (*b*) The epithelium of the mucous membrane participates after two days, and then plays an unimportant part. (*c*) From the third day the proliferation of connective tissue comes to the fore and leads to definite occlusion. The membrana propria, if concerned at all, takes but a slight part. The experiments were made in the Pathological Institute at Bonn.

8. After reviewing the literature, KILLIAN gives his own observations. He has examined the Crocodilus niloticus, biporca-

tus, acutus, an alligator from the Mississippi, and lizards and frogs for comparison. In crocodiles he found a muscular elevator and depressor auriculæ, which open and close the aural flap. A third muscle is found in the middle ear, which consists of three portions, and is attached to the postero-superior quadrant of the membrana tympani. Its contraction should stretch the drum membrane and at the same time erect the oblique columella, which increases the tension.

9. BUCK, having discovered that in the description he gave of the anatomy of the elephant's ear in the Transact. of 1888, the plane of the section was vertical instead of horizontal, has in this paper revised that description in the light of this discovery. It is illustrated freely, but is too long and elaborate for a mere abstract to do it justice. SWAN M. BURNETT.

10. This paper of RICHARDS, like that of Buck, cannot be intelligently reported in a short abstract. It is a study of the same specimen as forms the foundation of Buck's paper.

SWAN M. BURNETT.

11. GRADENIGO publishes six well observed cases of influenza of the ear. He examined the secretions of the ear bacteriologically, and found the diplococcus as well as the micrococcus and the staphylococcus and the staphylococcus pyogenes. The course of the otitis in influenza may be severe in one case, as in other inflammations of the middle ear, and slight in the other.

12. KIRCHNER found the middle ear of a child, who died of laryngeal diphtheria, in the initial stage of diphtheria. Besides a slightly fibrinous deposit upon the mucous membrane of the middle ear, which was imbued with cocci, there was found a dense infiltration of small cells in the nerve sheath of the chorda tympani, so as to compress well nigh half of its transverse section. Cocci and fibrinous masses had not entered the nerve.

13. The first of the two cases has been described at the meeting of German naturalists at Heidelberg. The second case exhibited cholesteatoma in a patient suffering from purulent meningitis, originating from the ear, in which a direct connection with the integument could not be proved, but was assumed as quite probable. The author arrives finally at the following conclusion: if it should be concluded from the examination of cholesteatoma of the first two cases with positiveness, from that of the latter with probability, that the growing of the epidermis of the external auditory meatus or of the membrana tympani princi-

pally led in these cases to the formation of cholesteatoma, it can by no means be asserted that I should presuppose the same origin for all cases of cholesteatoma. I readily admit that cholesteatoma may originate as a real growth in the middle ear or by metaplasia of the epithelium of the tympanum, which facts have been proven by observations of other authors. I have added, based upon clinical experience, that the mode of development as I have described it occurs most frequently, an assertion which has been confirmed in the meantime by Bezold, Moos, and Politzer.

14. RANDALL relates the histories of several cases in which tumors more or less cholesteatomatous were found in the middle ear and invading neighboring parts. While not doubting that some such tumors may be primary, he still regards them as mostly secondary to inflammatory processes. SWAN M. BURNETT.

15. POLITZER first describes the embryonic state of the middle ear, and points out that the threads and membranes remaining from the retrogressive changes do not generally interfere with the hearing faculty; that they may readily cause, however, cicatricial adhesion in case of catarrh or inflammation. The cicatricial adhesions of the stapes are most frequently found at the lower crus, because it is much nearer to the tympanic wall than the upper. Between the bands and membranes near the oval window there are found in catarrh adhesive masses of mucus, deposits of small cells, and hemorrhages. In "dry catarrh," or membranous anchylosis (anchylosis spuria), and in some cases a genuine osseous anchylosis is not infrequently observed. The appearances of suppuration of the middle ear are as follows: swelling of the mucous membrane, new formations of cicatricial tissue, cysts, cholesteatoma, together with loss of ossicles or their partial destruction. At the round window the niche is found to have a different direction and width. The membrane is, in some cases, transparent, in others dull, or it is covered with a complete or perforated mucous layer. In rare cases bone replaces the membrane for the greater part. In chronic suppurations the niche is frequently filled with hyperplastic tissue or granulations, which were found by Politzer in one case to contain fat tissue. In an adult deaf-mute a hardly perceptible deepening was found in the bone in place of the round window. The lecture was illustrated by demonstrations of a large number of macroscopical and microscopical specimens.

16. HOLGER MYGIND gives a synopsis of the records of the

autopsies of deaf-mutes, and thus reviews 119 undoubted cases from the literature of the subject. He concludes therefrom that the result of various, principally former, autopsies was negative. In some cases the cause of deaf-mutism should be looked for exclusively in the middle ear. In two thirds of the cases pathological changes were found in the labyrinth. Vestibule and cochlea exhibit an almost equal frequency of disease. There is a striking frequency of affection of the semicircular canals. It is difficult to distinguish congenital changes from acquired ones. Undoubted evidences of arrested development are rarely found in the labyrinth, but most frequently in the cochlea. Atrophy and degeneration of the auditory nerves are exceptions.

17. The membranous semicircular canals develop from the primary labyrinth vesicle by a pouch-like bulging of its walls; the epithelium being brought into the centre where it is blended and absorbed. The two vertical semicircular canals arise from a common pouch in such a manner as to bring the epithelia in two places together, where they are absorbed, while the intermediate portion remains open and forms the common crus of both vertical semicircular canals. The horizontal semicircular canal originates in a separate pouch, which protrudes from the labyrinthian wall opposite to the entrance of the ductus endolymphaticus. The upper vertical semicircular canal develops first, then follows the lower vertical, and finally the horizontal canal separates. The ampullæ develop simultaneously with the semicircular canals.

18. GRADENIGO discusses briefly the relation between meningitis and meningitis cerebro-spinalis, and affections of the inner ear, as also inversely that between suppuration of the middle ear and meningitis, with reference to observations of his own and others.

19. In the new-born cat, the fibres belonging to the tuberculum acusticum and to the anterior auditory nucleus develop successively. At least four systems of fibres, two ventral and two dorsal ones, arise from the primary centres of the cochlear nerve. Three of these participate in the formation of the trapezoid body, one dorsal crosses partially behind the latter in the raphé, and then attaches itself to the trapezoid body near the upper olives. The lower brachium of the corpora quadrigemina has a double connection with the cochlear nerve, viz., from the tuberculum acusticum and from the anterior nucleus of the acoustic. In man only, the tract from the anterior auditory

nucleus to the trapezoid body is plainly visible. The vestibular nerve is principally connected with gray masses, which have relations with the cerebellum. The cochlear and vestibular nerves, therefore, are entirely different as regards their central connections.

" Baginsky, according to FLECHSIG's investigations is not justified in denying the crossing of the striæ acust. in the raphé, as is stated by Monakow, and his entire description proves that he has not recognized, with entire correctness, the central tract of the acoustic in the cat."

20. The middle lobe of the cerebellum governs the co-ordination of movement. This is possible, provided it exerts its influence upon the motor cortex of the cerebellar hemisphere. Its effect cannot be directed downward, for the two tracts of the spinal cord, the tract between the cerebellum and the spinal lateral column and also the posterior column, which are connected with the cerebellum, lead upward. There exists no proof of the fact that any fibre of the cerebellum descends to the spinal cord. The two above-mentioned tracts probably consist only of the ascending nerves of the muscles.

The impulses which govern these nerves are usually not perceptible, but it may be proven, *per exclusionem*, that our conception of position depends upon them. Strong impulses act upon our consciousness, thereby proving that the nerves are irritated. During a muscular convulsion, the pressure upon the nerve terminations, which are situated in the tissue connecting the muscular fibres, produces a painful sensation, and, after the convulsion, the muscular extension is expressed by pain. This lateral pressure and the longitudinal stretching are the means by which the nerves are irritated. This is the mechanism by which the passive state of the muscles exerts an influence upon the cerebellar cells. " *The cerebellum is reached also by the fibres of the acoustic, and probably also by those of the semicircular canals.*" The cells are probably also influenced by the action of the motor nerves belonging to the eyeball. These impressions are alike, inasmuch as they do not produce any sensation, and still their effect aids in the perception of the position of the body and its relation to the outside world. The condition of the nervous cells, which is thus produced, can influence the movement only in such a manner as to act upon the motor cortex, where the movements are co-ordinated.

This influence is conducted, through well-known paths, directly or indirectly, from the gray substance of the thalamus opticus or of the corpus striatum.

We understand, therefore, why the middle lobe, although of the same structure as the cerebellar hemispheres, has a different function.

The middle lobe is a regulating centre for those centripetal impulses which bear an especial relation to the motor phenomena, which are dependent upon the maintenance of the equilibrium and upon other movements, inasmuch as the latter are not produced by impression of the skin, but by the condition of the muscles.

About the further application of the theses mentioned, *e. g.*, concerning the knee phenomenon, compare the original.

Moos.

21. Aurists will be interested principally in that part of Lecture iv. which refers to the location of the hearing centre. Dr. FERRIER insists upon his original supposition that in the higher animals and in man the main seat of the hearing perceptions is in the upper parietal convolutions. Those who were present at the International Medical Congress at London, in 1881, will remember the experimental demonstration of this fact by Dr. Ferrier. The monkey, which was demonstrated at that time, remained deaf up to its death, which occurred ten months after the operation. Schaefer's experiments, of course, were opposed to this theory, but on account of experiments which were subsequently made, Dr. Ferrier does not feel disposed to change his opinion, which was later on confirmed by clinical observation. With reference to the experiments of Baginsky, Dr. Ferrier believes that the auditory nerve is probably connected with the centre, through the lower brachium of the other side, by means of the tuberculum posterius of the corpus quadrigeminum and of the corpus geniculatum internum et externum, and with the medullary fibres of the cerebral cortex. He is also in accordance with the views of Luciani and Tamburini, that a decussation of the fibres of the auditory nerves takes place similarly to that of the optic nerves, so that both ears are represented in each cerebral hemisphere ; furthermore, he comes to the conclusion that only the vestibular fibres, which arise from the membranous semicircular canals, take their course through the cerebellum.

URBAN PRITCHARD.

b.—NASO-PHARYNX.

1. HESS, KARL. A case of multiple dermato-myomata upon the nose. *Virchow's Archiv*, vol. cxx., p. 321.

2. SCHWENDT, of Bâle. The congenital occlusions of the posterior nares and their operative treatment. Lectureship thesis. With seven plates.

3. KAFEMANN, A., Koenigsberg. Anatomical and therapeutical relations of the fornix pharyngis. *Monatsschr. f. Ohrenheilk.*, 1890, pp. 72, 102.

1. The specimens were taken from a girl, nineteen years of age. They were found to consist of multiple dermato-myomata, of the size of a millet-seed to a linseed.

2. We limit our remarks upon this very elaborate and well-gotten-up monograph to the reiteration of the final conclusions: (*a.*) Congenital occlusions are either soft or osseous. The diaphragms of some cases of the former are situated behind the choanæ and behind the Eustachian tube, in the latter always within the nasal cavities. (*b.*) Congenital atresia of the posterior nares occurs in monstrosities or in viable, otherwise completely or approximately well-developed, individuals. The osseous occlusion is in either case more frequent. (*c.*) Among viable individuals, whose nasal cavities ended backward into a blind sac, the osseous occlusion is the most frequent. The greater number of the latter are typical cases, the first exact description of which is due to Emmert, while their rhinoscopic picture was first made known by the investigations of Zaufal and Schroetter. According to the experience gathered up to date in these typical cases, bilateral occlusions and those of the right choana appear to be more frequent than those of the left choana. These cases, which greatly resemble each other, bear a certain relation on account of the peculiar structure of the palate to some of the above-mentioned malformations. (*d.*) The faculty of accommodation of the human system to the congenital atresia of the choanæ is so great as not to necessitate a removal of the trouble in individuals who have passed childhood. Atresia is perilous immediately after birth and during infancy. The most successful cures of this affection are to be expected from pediatrics. (*e.*) The sense of smell is incompletely or not at all restored in these typical cases. The sensation of taste may be comparatively well developed, even if smell is entirely missing (different volatile oils, *e. g.*, are distinguished and

named). (*f.*) In congenital osseous occlusions are lapse is much more to be feared after operation than in congenital soft occlusions. Continuous after-treatment with permanent canulas is indispensable for cases of the former kind. (*g.*) For operation with the galvano-cautery the introduction of the burner through the naso-pharynx, under the guidance of the rhinoscopic mirror, is preferable to that through the nasal meatuses.

3. KAFEMANN bases his conclusions upon observations in the living and principally upon examinations of specimens. The bursa, tonsillar and fibrous, is found exclusively in the limited region of the recessus phar. medius tonsillaris, and is in no case laterally situated. A marked oval fibrous recessus usually corresponds with a more or less scaphoid deepening in the bone, a recessus phar. osseus. He distinguishes a recessus phar. medius tonsillaris and a recessus phar. medius massæ fibrosæ. The latter shows different features, with their mucous membrane without cysts, with their mucous membrane and with formation of cysts, with strong development of mucous membrane without cysts, with thick mucous membrane and with formation of cysts.

II.—PHYSIOLOGY AND PHYSICS.

a.—HEARING ORGAN.

1. HERMANN, L. The relation of the vowels in Edison's new phonograph. (From the Physiological Institute at Koenigsberg.) *Pflüger's Archiv*, vol. xlvii., p. 42.

2. HERMANN, L. Phono-photographic investigations. (From the Physiological Institute at Koenigsberg.) *Pflüger's Archiv*, vol. xlvii., pp. 44 and 347. With one plate.

3. EWALD, Prof. R., Strassburg. Can the trunk of the auditory nerve be excited by sound? *Berliner klin. Wochenschr.*, 1890, August 7th.

4. EWALD, Prof. R. Motor disturbances after injuries to the semicircular canals. *Centralbl. f. d. med. Wissench.*, 1890, pp. 114 and 130.

1. HERMANN intended to examine whether the characteristics of the vowels are fixed or comparatively partial notes. If the cylinders upon which the vowels were impressed were turned during the reproduction too quickly or too slowly, all vowels

sounded very much like a sound between ae and oe (German). It therefore follows that one of the main characteristics of the vowels is based upon comparatively fixed partial tones.

2. In the first part we find a brief description of the improved photographic method of taking vibratory curves and their mathematical measurement, analysis, and computation, for which we must refer to the original. From the second paper it is worthy of mention that examinations with but one kind of membrane cannot reveal the character of the vowels. Those characteristics of the vowels are far more valuable which remain unchanged in all membranes fit for experiment, whether they present differences in the mode of vibration or not. The appended curves are excellent and very instructive. As the most general characteristic of the vowel curves he found that they contain an upper tone periodical or in periodical increment, and that the period corresponds to that of the voice tone. For the representation of the true characteristics of the vowel curve Hermann considers Fourier's analysis hardly useful, and he principally used the method of counting off and proportional measurement. With reference to the five main vowels, he arrives at the following result: they consist of a comparatively firm mouth tone, which oscillates beat-like during the period of the voice tone in its intensity. The position of these tones is arranged according to the pitch: in U c^2—d^2, O d^2—e^2, A e^2—g^2 sharp, E b^2—c^4, I d^4—g^4. The almost constant oscillation cannot be referred to the simultaneous vibration of the membrane, but is peculiar to the vowel, as well as the fact that the fundamental tone of the vowel sound appears comparatively little marked. Parallel experiments with Edison's new phonograph confirm these results. After considering the prevailing vowel theories, he lays down a new theory as follows: the essential feature of the vowel is the intermittent or oscillating afflation of the mouth-tone by the voice. It is immaterial whether the period of the voice-tone comprises an exact fraction of the large period or not; in other words, whether the mouth-tone is in harmony with the laryngeal tone. In accordance with these results Hermann tried to produce the vowels synthetically, and he arrived, after experiments with Savart's wheel and with perforation sirens, at the conclusion that beats of sufficient frequency may produce tone. The common differential tones are therefore of a subjective character. With Helmholtz's double siren, when quickly turned, not only the differential tone as

dominant tone could be produced, but this differential tone had the marked character of the vowel O, with greater celerity that of Ao, and with still more rapid turns that of a distinct A.

3. EWALD removed the entire inner ear of pigeons, an operation which lasts on one side from four to six hours. "The trunks of all the branches of the auditory nerve are seen to project from their osseous openings, and I can indeed prove the removal of the entire labyrinth." The pigeons could hear without any doubt. "I succeeded in some cases, by introducing a cauterizing paste, in producing degeneration of the trunk of the acoustic, and in these cases the pigeons became entirely deaf, without additional hearing disturbances." On account of the different views held by aurists on this question the reviewer considers it to be his duty to point out the fact that Ewald has probably left, after removal of the labyrinth, a large part of the endings of the acoustic, which by their attachment render dissection of the entire membranous labyrinth very difficult.

b.—NASO-PHARYNX.

1. ZIEM, C. The deformity of the spinal column in obstructing nasal troubles. *Monatsschr. f. Ohrenheilk.*, etc., 1890, p. 134.

2. PROUHO, M. Note on the sense of smell in the star-fish. (Du sens de l'odorat chez les étoiles de mer.) Presented by de Lacaze-Duthiers. *Compt. rend.*, vol. cx., p. 1343.

1. ZIEM occluded by operation the nostril of a young rabbit, and observed the subsequent pronounced formation of scoliosis of the spinal column. He refers to the possible connection of both troubles in man.

2. The sense of smell of the star-fish is not diffusely spread through the entire body, but localized in the ambulacral tubes, which are unfit for motion, and are situated behind the polypoid extremity (plaque ocellaire).

II.—PATHOLOGY AND THERAPEUTICS.

BY A. HARTMANN, BERLIN.
Translated by Dr. MAX TOEPLITZ, New York.

a.—GENERAL LITERATURE.

1. KLINISCHES JAHRBUCH, vol. ii. (Statistics of the clinics and policlinics for aural diseases at the universities of Prussia.) Berlin, 1890, pp. 646 and 652.

2. Prof. SCHWARTZE. Statistics on the attendance of ear patients and students at the royal university ear clinic at Halle, from April 1, 1884, until April 1, 1889. *Arch. f. Ohrenheilk.*, vol. xxix., p. 295.

3. LUDEWIG. Report on the work done at the royal university ear clinic at Halle, from April 1, 1888, until March 31, 1889. *Arch. f. Ohrenheilk.*, vol. xxix., p. 263.

4. SCHUBERT, Nuremberg. Report on the second otological quinquennium. *Arch. f. Ohrenheilk.*, vol. xxx., p. 45.

5. HECKE, O., Breslau. Report on cases observed and operations made at my policlinic and clinic for aural diseases in the year 1888. *Arch. f. Ohrenheilk.*, vol. xxx., p. 67.

6. RICHARDS, HUNTINGTON. Work in the ear department of the Vanderbilt clinic. *Medical Record*, September 27, 1890.

7. GRADENIGO. The importance of the study of otology (L' importanza dello studio della otologia). Turin, 1890.

8. GOMPERZ, B., Vienna. Earache and its treatment. *Centrabl. f. die gesammte Therapie*, 1890, No. 5.

9. STEIN, STANISLAUS VON, Moscow. Resorcin combined with cocaine in aural diseases. *Monatsschr. f. Ohrenheilk.*, 1890, No. 3.

10. Prof. E. ZAUFAL. Bacteriological contributions to otitis media in influenza. *Prager med. Wochenschr.*, 1890, No. 8.

11. HABERMANN. Contributions to the study of ear affections in influenza. *Prager med. Wochenschr.*, 1890, No. 8.

12. Prof. Dr. A. POLITZER. Diseases of the hearing organ during the last epidemic of influenza. *Wiener med. Blätter*, Nos. 9 and 10.

13. Prof. Dr. GRUBER. Diseases of the hearing organ during the last epidemic of influenza. *Allgem. Wiener med. Ztg.*, 1890. No. 10.

14. EITELBERG, A. Influenza and otitis media (L' influenza et l'otite moyenne). *Archivio internationale de laryngologia, otologia, et rinologia.*

15. IDEM. Aural affections in influenza. *Wiener med. Presse*, 1890, No. 7.

16. LOEWENBERG, Paris. Ear complications during the present epidemic of influenza (Les complications auriculaires dans l'épidémie actuelle d'influenza). *Bull. méd.*, 1890, No. 3.

17. MÉNIÈRE, Paris. Ear complications of the grippe (Complications auriculaires de la grippe). *Soc. franç. otol. et laryngol.*, May 10, 1890.

18. LANNOIS. Deafness of the labyrinth following the grippe (Surdité labyrinthique consécutive à la grippe). *Revue de laryngol.*, 1890, No. 17.

19. ROHRER, Zurich. Affections of the ear in influenza. *Archiv f. Ohrenheilk.*, vol. xxx., p. 119.

20. SCHWENDT, A., Bâle. Diseases of the hearing organ caused by influenza. Bâle, 1890.

21. JANKAN, LUDWIG, Strassburg, Otitis media following influenza. *Deutsche med. Wochenschr.*, 1890, No. 12.

22. SCHWABACH, Berlin. Otitis media acuta in influenza. *Berliner klin. Wochenschr.*, 1890, No. 3.

23. KATZ, L., Berlin. Aural diseases in influenza. *Therapeutische Monatsh.*, 1890. No. 2.

24. MICHAEL I., Hamburg. The nature of influenza, with special reference to aural symptoms. *Deutsche med. Wochenschr.*, 1890, No. 6.

25. Prof. ROBERT LEUDET, Rouen. Aural hemorrhage in hypertrophic cirrhosis (Otorrhagie dans la cirrhose hypertrophique). *Annal. des mal. de l'oreille*, etc., 1890, No. 10.

26. MORPURGO, Triest. The condition of the hearing organ in tabes. *Arch. f. Ohrenheilk.*, vol. xxx., p. 26.

27. IDEM. Tabes of the hearing organ in tabes dorsalis (Sulla tabe dell' organo auditivo nella tabe dorsale). *Boll. delle malattie del' orecchio*, etc., 1890, No. 1.

28. HABERMANN, I., Prague. Hardness of hearing in boilermakers. *Arch. f. Ohrenheilk.*, vol. xxx., p. 1.

29. NOËL. Effect of detonations upon the ear (De l'action des détonations sur l'oreille). *Bull. méd.*, 1890, Oct. 1.

30. MANOURRIER. Localization of aural sensations (Localisations des sensations auditives). *Soc. d'anthropologie de Paris.* March, 1890.

31. SCHWENDT, A. Deaf-mutism, its cause and prevention. *Lectureship paper*, Bâle, 1890.

32. LONGHI, Pavia. Deafness, deaf-mutism, and the Institute Ototerapico.

33. LANNOIS, Lyon. Deaf-mutism, and the deaf-mutes before the law (La surdi-mutité et les sourds-muets devant la loi), Paris, 1889.

34. The sanitary service in the German armies during the war against France, 1870–71. Vol. v., No. iii. Surg. part: *C.* Cases of large operations. Berlin, Mitler & Son, 1884. Vol. iii., Spec. part, Surg. part, *a* Injuries to the head and body. *Ibidem.* 1888, x.; *Cp. Chir. Centralbl.*, No. 49, 1889.

1. In the royal Prussian university clinics and policlinics for aural diseases, the following cases underwent treatment during the clinical year 1888–89.

	Berlin.	Bonn.	Göttingen.	Greifswald.	Halle	Koenigsberg.
I. Auricle	106	59	49	16	28	19
II. External meatus	1425	364	513	94	280	167
III. Membrana tympani	32	21	10	93	15	2
IV. Middle ear	3902	811	953	337	1572	534
V. Inner ear	191	16	74	11	79	31
VI. Caries of temporal bone	2	91	—	6	—	—
VII. Diseases of the nose and naso-pharynx	201	855	220	103	100	533
VIII. Other diseases	15	16	8	—	—	—
Number of treated cases	5879	2233	1827	660	2074	1286
Number of treated persons	4758	—	1407	334	1875	788

The number of students and physicians attending the clinics and policlinics during the summer semester, 1888, and during the winter semester, 1888–89, was as follows:

	Summer Semester, 1888. Students and Physicians.	Winter Semester, 1888–89. Students and Physicians.
Berlin	20	19
Bonn	59	28
Göttingen	29	16
Halle	47	44
Koenigsberg	31	7

2. In the in-door clinic at Halle, 620 persons were admitted during five years, and 6,041 were treated at the policlinic. The

lectures were attended by 283 students, and 37 physicians attended the clinic for instruction. RUMLER (Berlin).

3. One thousand five hundred and fifteen patients, with 2,070 diseases, were treated in Halle, during the clinical year, 1888–89. One hundred and sixty-six persons were admitted to the indoor clinic. Among the latter was a child, in whom a sharply edged stone was pushed into the tympanum by improper attempts of extraction. The difficult removal was successfully performed by means of Zaufal's lever, which is always used with predilection. Of especial interest are: A case of bilateral microtia and atresia of the external meatus; unsuccessful attempt at restoring the latter; pyæmia with recovery. Tuberculosis of the ear: Patient with advanced phthisis pulmonum underwent treatment for a painless otitis purulenta dextra. There was in front of the handle of the malleus a roundish perforation, and in the posterior segment three ulcers at different stages. Ten cases with syphilis, five of which were acquired, and five hereditary. Of the clinical patients ten died, whose histories are fully reported. Fifty chisellings of the mastoid process were performed. RUMLER.

4. SCHUBERT treated 3,316 ear patients from June 1, 1884, until May 31, 1889. Among the classified diseases, "a polypus of the external meatus, is worthy of mention." Below cerumen and epithelial masses a polypus appears, which is inserted into the anterior wall of the osseous meatus, whereas the drum membrane is uninjured and without inflammation. Schubert's views upon suppurations of the middle ear, associated with perforations of Shrapnell's membrane, claim especial attention. He arrives at the following result: "With increased experience I become more firmly convinced, that by far the majority of these cases can be cured by operation only." Schubert's view upon "the removal of the carious hammer, being necessitated by general surgical principles," is in accordance with the present opinions of aurists. In two cases the function of the ear was not interfered with after excision of the malleus. The opening of the mastoid process was found to be necessary in twenty-one cases. In one case primary otitis of the mastoid without affection of the tympanum was present. Among nasal diseases, only the empyema of Highmore's antrum is discussed. RUMLER.

5. HECKE treated 385 patients in his policlinic. In three cases the drum-membrane and the malleus were excised, one of

which showed improvement of hearing, and the two others no impairment. The chiselling of the mastoid process and the opening of the antrum were performed in eighteen cases, of which eight were cured, three died and seven remained under treatment. RUMLER.

6. RICHARDS reports that from the opening of the ear department of the Vanderbilt clinic, January 1, 1888, up to May 24, 1890, 1,500 cases have been entered. It appears the histories of the cases are kept very fully and elaborately. Chron. median catarrh forms, of course, the larger number, 595 cases being recorded; chronic purulent otitis comes next with 431 cases, while there were 539 cases of acute otitis. Three operations on the mastoid were performed, two successful.

SWAN M. BURNETT.

7. GRADENIGO argues upon the importance of the study of otology. In Italy clinical instruction exists only at the universities of Rome, Turin, Milan, Naples, and Florence.

8. GOMPERZ discusses the methods of treatment of the different aural diseases associated with otalgia. We emphasize the recommendation of Gruber's treatment of aural furunculosis with gelatine preparations. (℞ Extr. opii aquosi 0.1, gelatinæ albæ, q. s. u. f. amygdalæ aurium [Gruber] No. x.) Gomperz saw the furuncles disappear in a brief period "with a certain regularity," and the pain to abate. For the relief of pain in otitis media acuta Gomperz recommends instillations of warm solutions of cocaine of 5 to 10 per cent., which may be also injected through the catheter. Early paracentesis. In otalgia nervosa Gomperz has found antipyrine to answer the indication best.

9. Resorcin introduced into otology, by de Rossi, according to STEIN'S synopsis from literature, has an antiseptic, analgetic, vaso-constrictor, and antiphlogistic action, furthers the epithelial regeneration; it acts, however, but slowly and superficially. Cocaine allays pain, diminishes secretion, is but little antiseptic, and increases the faculty of absorbing, especially in hyperæmic tissues, since, when instilled more frequently, it macerates the epithelium of the membrana tympani and readily produces symptoms of intoxication in acute processes. Stein uses a combination of resorcin 0.1, cocain. muriat. 0.2–0.5, aq. dest. 10.0 (to which morph. 0.01–0.05 is added when pain is present), in children and adults. A few drops of the warm solution are instilled two

to four times daily into the ear and removed with cotton after five to fifteen minutes. The auricle should be treated with ointments before and after the instillation, in order to avoid itching and eczema. After an experience of three years and a half. Stein recommends this treatment in myringitis acuta, otitis med, acut. catarrh. (also especially in the later stage), and otitis med. chron. catarrh.; in perforations the ear should be previously syringed with solutions of boric acid; in sclerosis the drug should be injected per tubam, and in purulent otitis the remedy is of value with not too large perforations (granulations may disappear without cauterizations). KILLIAN, Freiburg.

10. ZAUFAL found in a case of otitis media, following influenza, the streptococcus pyogenes in the secretions of the tympanum, in a second case the diplococcus pneumoniæ, A. FRAENKEL-WEICHSELBAUM (Finkler found the streptococcus pyogenes in one case, and associated with this the staphylococcus pyogenes albus in another).

11. HABERMANN reports thirty-nine cases of otitis media in influenza.

12. POLITZER divides the cases he observed into two classes: (*a*) affection of the hearing organ during influenza or after it in individuals with previously normal ears; and (*b*) exacerbations and relapses of previous aural affections. The cases of the first class are frequently distinguished from other genuine otitides by their great intensity. In a number of cases myringitis bullosa hemorrhagica, which has been first described by Politzer, was observed; intense pain and annoying objective noises persisted in some cases, after the perforation of the membrana tympani had closed, for days and weeks. The course taken by the purulent otitis with perforation of the membrana tympani was in many cases of long duration and led frequently to formation of abscess in the mastoid process. The treatment paid especial attention to the allaying of pain; it differed, however, not materially from the usual methods. NOLTENIUS, Bremen.

13. GRUBER emphasizes, in accordance with all other authors, that extreme hyperæmia of the affected structures, intense pain, and comparatively frequent implication of the mastoid process have been the foremost features of interest. The author holds, that the process of the ear could frequently not be considered as transferred from the naso-pharynx, but as an independent affection of the ear. NOLTENIUS.

14 and 15. EITELBERG agrees with other authors, that intense hyperæmia of the diseased structures associated with intense pain is characteristic of the aural affections due to influenza; he emphasizes, however, the mostly favorable and rapid course of the affection, and reports among a large number of these observations only one case of transmission of the affection to the mastoid process so as to necessitate its direct treatment. The histories illustrate his views. NOLTENIUS.

16. LOEWENBERG has observed twenty cases of otitis media following influenza. The symptoms are as follows: intense pain which disappears after the establishment of perforation, rapid recovery. He does not mention hemorrhages.

17. MÉNIÈRE gives statistics of the cases of his own observation and arrives at the following conclusions: (*a*) Rapid affection of the middle ear with marked local and general symptoms at the beginning, profuse purulent discharge, inflammation of the periosteum, and of the mastoid cells. (*b*) Rapid improvement, recovery without disturbances in the ear, formation of cicatrices in the membrana tympani, normal hearing. (*c*) Good result of antiseptic treatment and of injections. GELLÉ, Paris.

18. LANNOIS reports two cases in which the grippe had comparatively slightly affected the middle ear, but had led to severe disturbances in the labyrinth. In the observation sudden and complete deafness, subjective intense noises and an almost permanent vertiginous condition were noted. In the second case there was slight otitis media with almost complete deafness, the absent perception of the tuning-fork proving a lesion of the inner ear. GELLÉ.

19–24. ROHRER observed in the acute inflammations due to influenza in only one case an extraordinary course, viz., a hemorrhage, which continued to a slight extent for two days and was caused by erosion of vessels of the drum-membrane during perforation of the membrane. The other authors, SCHWENDT, JANKAN, SCHWABACH, KATZ, and MICHAEL, emphasize in opposition to Rohrer's view the frequent appearance of severe hemorrhagic inflammation of the drum-membrane. The membrana tympani reveals intense redness and in some cases hemorrhages into its tissue. The course of otitis in influenza is concurrently described as not unfavorable in spite of the great intensity of the symptoms at the beginning. Schwabach observed among sixty-two cases two perforations of Shrapnell's membrane.

25. Hemorrhage from the ear is one of the rarest hemorrhages in liver troubles. The hemorrhages occur, according to their frequency, as follows: nasal, oral, intestinal, stomach, and cutaneous bleedings, still rarer are the bronchial hemorrhages, while the nephritic and pulmonary ones come last. In the entire list of classical treatises LEUDET does not find the aural hemorrhage mentioned; in his own practice he has met with but one case, which he published at the time it occurred. This patient had entered the hospital for hypertrophic liver cirrhosis, and was seized at night for the first time with quite a profuse aural bleeding. Two days later an additional hemorrhage, more profuse than the first one and again from the left ear. The patient had up to date never noticed a bleeding from the ears. Since that day the patient has bled every day from the ear, but less profusely than the first time. Unfortunately the patient left the hospital without an examination of the ear. GELLÉ.

26 and 27. MORPURGO examined fifty-three patients with tabes with reference to the condition of the hearing organ, and arrived at the surprising result, that there were among them but ten with normal hearing. Among these forty-three ear patients there were thirty-five cases with bilateral positive Rinné, among which were several with exquisite positive result, in some cases with a hearing power (for whisper) of 20 *cm;* in twenty-six cases of bilateral positive Rinné the drum-membrane was normal. Ear inflation improved the hearing power only in three cases. The hearing faculty was on the whole uniformly preserved for different pitch of tone. Morpurgo infers from these facts "that altogether an affection of the sound-perceiving apparatus is found." RUMLER.

28. HABERMANN examines the hearing organs of a patient suffering from boiler-maker deafness. For the explanation of the histological condition he first makes himself acquainted with the functional disturbances as observed in a large number (thirty-one) of living boiler-makers. He found in all persons examined a more or less marked degree of hardness of hearing. It is noteworthy that the loud voice was heard comparatively better than the whisper. In all persons the bone-conduction for the tuning-fork C (128 vibrations) and also the aërial conduction were diminished respectively. Rinné's experiment had in all cases a pronounced positive result. The hearing for the highest notes was extremely diminished. Pathological changes were

missing in the middle ear. It is of considerable interest to note that in some boiler-makers, in whom an affection of the middle ear was found, the hearing was comparatively better than in those with normal middle ear. Habermann considers, therefore, the impediment of sound transmission as a protecting apparatus against the injurious action of too strong noises. Subjective noises were found in fifty per cent. of the cases; naso-pharyngeal catarrh only in six cases. The hearing organs, which were examined histologically, were taken from a man seventy-five years of age, who had been working for twenty years in copper works where loud noises existed. The macroscopical examination of both hearing organs reveals their normal condition. From the result of the microscopical examination we emphasize the following points: Atrophy of the nerve trunks in the entire inner ear. In the basal cochlear turn there were found in the canalis ganglionaris but a few ganglionic cells, and the canal was filled besides with mucoid connective tissue; in place of Corti's organ there was an indistinct mass of cells. Towards the cupola of the cochlea the structures were found to be normal. Habermann points out especially the condition of both windows. The basal plate of the stapes appeared in its anterior half drawn extremely outward, and its hindermost portion was moved inward to a large extent, thus being in a position as it is produced by an extreme pull of the stapedius muscle. The membrane of the round window was somewhat bulged towards the tympanic cavity. In the left hearing organ approximately the same condition. Habermann supposes "that, through the permanent excessive excitement of the nervous end-apparatus of the inner ear, a diminution of its excitability, in the basal turn, respectively, a paralysis, occurred, which led further to degeneration of Corti's organ placed out of function, and further to an ascending atrophy of the respective nerves." Habermann explained the extreme outward dislocation of both basal stapedial plates by a contraction of the Mm. stapedii caused by continued action of intense sound, probably also of high pitch. RUMLER.

29. NOËL commences with an historical review of the subject. The different accidents in consequence of detonations may be classed into the following four groups: (*a*) hypersecretion of cerumen; (*b*) rupture of the membrana tympani; (*c*) disturbances of hearing; (*d*) reflex troubles. The hypersecretion of cerumen was first described by Dr. Mourton. The rupture of the drum

membrane, with its usual symptoms, is well known. The disturbances of hearing are caused by hyper-irritation of the auditory nerve corresponding to that of the optic nerve in strong luminous impressions. It may be added that Holt believes that the affection of boiler-makers is due to anchylosis of the ossicles. Duplay supposes a lesion of the inner ear caused by detonations. The reflex disturbances are as follows : involuntary inflection of the head, diarrhœa, nausea, vertigo, headache, lancinating pain in the pharynx. Challes and Minnier have recorded six observations of dear-mutism—at times epilepsy or epileptoid tremor. In order to prevent the disturbances, Ferrant has devised an apparatus, two instruments adapted to the form of the auricle, which are attached by a band placed over the vertex. They were tried during firing exercises, and seemed to render good services.

GELLÉ.

30. MANOURRIER has found in different brains of executed persons differences in the appearance of the first temporal convolution in deaf individuals, whose middle ear was the seat of old lesions. He has observed simultaneously in the same individuals a more marked development of the facial centres (pli courbe) of the opposite side. This was seen in the case of Dr. Bertillon, who was deaf in one ear. At the autopsy Dr. Manourrier has made interesting investigations with reference to this point. GELLÉ.

31–33. SCHWENDT and LONGHI give a general description of all the conditions concerned in deaf-mutism, also LANNOIS, who points out that the intelligence of deaf-mutes is not interfered with ; so that good education is quite possible.

34. Injuries to the external auditory meatus were readily followed by stenosis, and even complete occlusion, causing considerable diminution of the hearing power. The operative restitution in one case was followed by considerable improvement of the hearing. Shells bursting in immediate neighborhood, or projectiles of large or small calibre rushing by, but principally, bruising and grazing shots in adjoining parts caused ruptures of the membrana tympani, and deafness. The latter was indeed most frequently caused by immediate injury to the aural region, or by fractures of bones beginning at other places, but extending in to the temporal bone or the middle ear respectively. Disturbances of the sensations of smell and taste were rare consequences of wounds of the skull ; disturbances of speech, however, occurred frequently in consequence of injury to the speech-

centre. In some cases complete and permanent, in others temporary complete or partial loss, finally but temporary or permanent impediment of speech. The left parietal bone usually forms the place of penetration for the projectiles; other bones of the skull, in rare cases, in which the projectile had reached, after penetration, the respective cerebral part. A Frenchman with fracture of the tibia became speechless with cerebral paroxysms following erysipelas, probably in consequence of paralysis of the speech-centre due to cerebral œdema. Moos.

b.—INSTRUMENTS AND METHODS OF EXAMINATION.

35. GELLÉ. Novel procedures of auto-examinations of the functions of the hearing organ (Nouveaux procédés d'auto-examen des fonctions de l'organe de l'ouie). *Annal. des mal. de l'oreille*, etc., 1890, No. 9.

36. IDEM. Signs derived from the comparison of the results of hearing and from the auscultation of the diapason vertex during deglutition and the other different modes of moving the auricular conducting apparatus (Signes tirées de la comparaison des résultats de l'audition et de l'auscultation du diapason vertex pendant la déglutition et les divers autre modes de mobiliser l'appareil auriculaire). *Mém. lu à la Soc. franç. d'otologie*, May, 1890.

37. RETHI. A new snare. *Wiener klin. Wochenschr.*, 1890, No. 4.

38. RETTIG, A., Saarbrücken. The audiphones (Die "Tonbringer"). *Monatsschr. f. Ohrenhielk.*, 1890, Nos. 5 and 6.

39. KATZ, Berlin. A holder for auscultation tubes. *Arch. f. Ohrenh.*, vol. xxx. p. 124.

40. VOHSEN., Frankfort-on-the-Main. Contribution to the electric illumination and translumination of cavities. *Berliner klin. Wochenschr.*, 1890, No. 12.

41. Prof. Dr. TRAUTMANN. Electric illumination apparatus for ear, nose, naso-pharynx, etc. *Deutsche med. Wochenschr.*, 1890, No. 15.

42. FLATAU, Berlin. An instrument for the fixation of Voltolini's nasal speculum. *Berliner klin. Wochenschr.*, 1890, No. 25.

43. BABER CRESSWELL, Brighton. Further remarks on the self-retaining palate-hook, including its use in post-nasal catheterism. *Brit. Med. Jour.*, June 28, 1890.

44. HOPMANN, Cologne. Palate-hook with elastic traction. *Monatsschr. f. Ohrenheilk.*, 1890, No. 5.

45. NOLTENIUS, Bremen. Mirror separable from reflector for demonstration of the laryngeal, naso-pharyngeal, nasal, and aural cavities, and also for auto-laryngoscopy of the patient. *Therapeutische Monatshefte*, 1890, No. 2.

46. PINS, Vienna. Novel method for nasal irrigations. *Wiener med. Wochenschr.*, 1890, No. 16.

35. GELLÉ established, from a series of experiments in which the tuning-fork was placed upon the vertex, the following changes in the hearing: (*a*) In the normal ear the cranial tone is changed with every in- and expiration through the tube connecting the mouth with the ear. A low snapping noise is simultaneously heard. The mobility and elasticity of the membrana tympani are equally perceptible, as well as that of the stapes. (*b*) The tone of the diapason vertex, which is central-median, is perceived on the side of the tube immediately after it has been introduced into the mouth; the resonance of the oral cavity produces this lateral displacement. If the mouth-piece is obstructed with the tip of the tongue, the sensation becomes, at will, lateral or median. (*c*) Contraction of the masticatory muscles decreases the tone of the diapason vertex. (*d*) The same effect is produced by contraction of the facial skin. The author then recommends to press the mouth-piece between the molar teeth. These different experiments furnish an important aid to auto-observation of the hearing organ. GELLÉ.

36. GELLÉ was frequently astonished at the difference between the results of examinations made with the otoscope, in which he auscultated the tone of the diapason vertex, and those which the patient himself stated he perceived. Various pathologico-anatomical conditions lead to concordant or opposite results. Under physiological conditions there exists an absolute accordance between the sensations of the patient and of the physician; this is a sign of good health of the organ and its movements. In case of disease, the results of examination may both be negative—viz., the tone of the diapason vertex does not undergo any change during the deglutition of the patient; and the physician has not

noticed any change. The author has confirmed these negative results in case of immobility of the drum-membrane, if the tube has been impervious for a long time. As long as the conducting apparatus is movable, both positive experiments may be in accordance, whatever the affection of the hearing organ may be. The most interesting cases are those in which the patient does not perceive any modification of the tone of the diapason vertex during deglutition, although the observer finds the decrease of the vertex tone. The non-concordant results are, the author thinks, very significative. Hence follows the loss of mobility of the stapes and the ossicles, whereas the mobility and elasticity of the membrana tympani are preserved. The other clinical appearances prove the correctness of the explanation of these observations.

GELLÉ.

37. RETHI, in order to facilitate the removal of the posterior extremities of the turbinated bodies by means of the snare, has provided the end of the snare with a joint for lateral movement. This is executed by a rod which is firmly attached to the instrument. An illustration of the instrument is added. NOLTENIUS.

38. RETTIG belived the suitably formed paraboloid to be an acoustic expedient, which may be compared with the spectacles, the telescope, or microscope. The tone is greatly increased by the concentration of the sound waves and by the simultaneous oscillation of the paraboloid. A new tone-centre thereby develops in the immediate neighborhood of the hearer. The increase of tone being the largest if the paraboloid is directed toward the source of sound ; the waves thus entering in the direction of the axis, the direction from which a sound approaches is readily recognized. Laterally entering waves are increased only by paraboloids with short focus. Wide-open and flat paraboloids do not increase the tone ; they eliminate, however, disturbing accessory noises. The troublesome resonance of the walls of the paraboloid may be removed by dampness. Rettig's apparatuses might be used : 1. For persons with normal hearing for the distinction of the lowest sounds and for large distances (direct telephony, etc., for medical purposes). 2. For deaf persons, in whom they may act also by bone-conduction. Speaking into the apparatus is unnecessary. KILLIAN, Freiburg.

39. The instrument consists of two curved pieces of metal which can be moved upon each other, in order to fasten the simple rubber tube.

40. VOHSEN uses for illumination a modification of the diaphotoscope of Schütz, which represents a self-illuminating, centrally perforated reflector, and furnishes *one* examining eye with the same intensity of light as *both*. Vohsen is very well satisfied with the apparatus, which he has used for a year. He also devised an instrument for the translumination of the following organs, larynx, trachea, and nose, which he described and tried. He arrives at the result that the translumination is a valuable aid for the diagnosis of nasal affections, and principally those of Highmore's antrum. RUMLER.

41. TRAUTMANN uses for examination a plane mirror with a handle, to the anterior surface of which a small incandescent lamp is attached. The light may be produced by a battery, or by accumulators.

42. The instrument is attached by means of a pelotte, which is fastened to the forehead by means of a truss spring placed sagittally over the patient's head. For details, see the drawing. RUMLER.

43. In this communication Dr. BABER gives an account of his further experience in the use of a palate-hook devised by him and described in a former number of the *Journal* (Jan'y 12th). With the help of this hook, brilliant illumination of the naso-pharynx is possible and a catheter can with a little manipulation be introduced into the orifice of the Eustachian tube through the mouth. The catheter used by Dr. Baber differs somewhat from those of Cutter, of Boston, and Fick and Kessel, inasmuch as its curves are all in the same plane, in this respect resembling the ordinary Eustachian catheter for use through the nose.

URBAN PRITCHARD, London.

44. HOPMANN'S palate-hook consists of a rod, 15 *cm* long, which broadens and curves in front like the usual palate-hooks, and provided with the sliding bar with two wing-like attachments as points of support for the index and middle-finger. The lateral hooks upon the rod and sliding-bar hold two rubber rings. The latter are stretched by pulling back the sliding-bar while the thumb presses upon the end of the rod. The instrument is thus introduced and attached with one hand. The wing-like attachments press against the upper lip; the stretched rubber rings hold the entire instrument in its position and draw the velum palati forward. The holder, when made of aluminium, weighs but 9.5 grammes. On account of its lightness and the absence

of irritation of the mucous membranes from aluminium, cocainization is mostly unnecessary. KILLIAN.

45. The arrangement devised originally by Peppmüller for the ophthalmoscope is transferred by Joël to the larygoscope. NOLTENIUS has corrected various faults, by giving the mirror for demonstration a trapezoid form with curved limitation of the lateral margin instead of the heretofore rectangular form; secondly, by making the mirror separable; and thirdly, by lessening the angle of inclination. JENS, Berlin.

46. Two glass tubes of different length are inserted into the double perforated and hermetically closing stopper of a bottle of any size. To the free end of longer tube reaching to the bottom of the vessel an olive with wide opening for one nostril is attached, while the shorter one is bent at a right angle above the stopper and is provided with a mouth-piece. The patient blows vigorously into the bottle, filled previously with the solution, and thereby forces the fluid through the nose during involuntary but energetic occlusion of the naso-pharynx by means of contraction of the velum palati. The fluid ought not to enter the frontal cavities or the tubes. The procedure is contra-indicted only in pulmonary emphysema, and also in affections of the heart and of the large vessels, on account of the high pressure during expiration. NOLTENIUS.

c.—EXTERNAL EAR.

47. HAMON DU FOUGERAY. Two cases of epithelioma of the auricle (Deux cas d'épithélioma du pavillon de l'oreille). *Annal. des mal. de l'oreille*, etc., April, 1890.

47 *a*. BISHOP, S. S. Imperforate auditory canals. *Jour. Amer. Med. Assoc.*, Sept. 20, 1890.

48. THEOBALD, SAMUEL. Report of a case in which a septum closely resembling the tympanal membrane formed in the middle third of the external auditory canal and was removed, with improvement to hearing. *Trans. Amer. Otol. Soc.*, 1890.

49. Prof. Dr. POLITZER, Vienna. Anatomical and clinical studies on the acquired atresia of the external auditory meatus. *Wien. med. Wochenschr.*, 1890, Nos. 20 and 21.

50. SZUMLANSKI, Warsaw. Contribution to the congenital malformation of the external ear. *Gazeta Lekarska*, 1890, No. 20.

51. KELLER, C., Cologne. The value of collodium treatment in relaxed membranæ tympani. *Monatsschr. f. Ohrenheilk.*, 1890, No. 1.

52. COUSINS, J. WARD. The value of the new antiseptic artificial membrana tympani. *Amer. Jour. of Med. Sciences*, February, 1890.

53. HAUG, RUDOLF, Munich. The artificial membrana tympani and the methods proposed for its substitution. An otological study. Published by Th. Ackermann, 1889.

54. BARCLAY, ROBERT. The use of the paper disc; case histories. *Trans. Amer. Otol. Society*, 1890.

55. LUDEWIG. Communication of cases. *Arch. f. Ohrenheilk.*, vol. xxiv., p. 234.

47. Epithelioma of the auricle is a rare affection. Dr. Ferreri has noticed but eight cases of epithelioma among 5,000 ear patients. Gaillet has published eleven observations, and O'Green eighteen. An extensive and timely operation is required. Thermocautery is preferred by FOUGERAY. GELLÉ.

47 *a*. BISHOP'S cases are: (*a*) a man of thirty-two years had the auricle torn off, and when it was replaced by the surgeon the auditory canal was covered over. An opening made in the cicatricial tissue covering the meatus restored useful hearing; (*b*) congenital closure of meatus on one side,—no interference; (*c*) same as case *b;* (*d*) auricle torn off, and when replaced the meatus was covered as in case *a*. The cicatricial tissue which covered and partly filled the canal was cut away and a small opening remained through which he had satisfactory hearing.

SWAN M. BURNETT.

48. THEOBALD'S case was a woman of thirty-nine years with a history of long-standing deafness with discharge. She said a piece of bone had been discharged from the ear. A septum, which in its appearance resembled the normal membrana tympani, was found across the middle third of the external auditory canal, completely closing it. It moved on performing Valsalva's experiment. The septum was incised and hearing was somewhat improved, and still further improved by a cotton artificial membrane. The normal membrane had been entirely destroyed. There was still some remaining otorrhœa. SWAN M. BURNETT.

49. A polypus, which had been repeatedly extirpated, and always relapsed, led to total adhesion with the walls of the external meatus, to complete deafness, and gradually developing facial paralysis. Death several years later from marasmus senilis. Autopsy. External meatus and upper portion of tympanic cavity filled with tense proliferations of connective tissue; no trace of

drum-membrane and ossicles, and cholesteatomatous masses in the middle and lower part of the cavum tympani. The tumor extends from the cupola through the Fallopian canal into the meatus auditorius internus, thence into the cochlear cavity and into the vestibule. Cochlea filled entirely, anterior and posterior ampullæ and canales semicirculares free. Backward from the pyramid several tumors of the size of a hazel-nut and smaller, lined with thickened dura and connected with the proliferation of connective tissue of the inner auditory meatus. In a second case, bilateral atresia of the osseous part of the external auditory meatus. Malleus partly displaced from the membrana tympani and adherent to the promontory. The mass of connective tissue is lined by several layers of epithelium ; its inner structure is loose, and it resembles an angioma with fat cells, amorphous pigment, and cystic cavities. The membrana tympani is only in its lower position firmly attached to the tumor. The fold between the membrana tympani and the apparently detached malleus proved to be the stretched substance of the membrana tympani. The author emphasizes the necessity of persistent removal of granulations sprouting at the bottom of the external auditory meatus in order to prevent the above-described consequences. NOLTENIUS.

50. SZUMLANSKI, in his patient, a girl aged seventeen, who complained of pain in the region of the right ear and of deafness in the same since her birth, found the following condition: The right helix was much larger than the left, and rolled up in such a manner as to direct its free margin in its upper portion downward, in the lower to the front. The anthelix formed a small projection, which, formed like a transversely situated "V," surrounded the spina helicis from above and below ; the antitragus was located closely below the spina helicis, and covered for the greater part from the rear the opening of the external auditory meatus. The crura furcata, the fossa interfurcata, and the tragus were absent. There existed, of course, no incisura intertragica. The lower portion of the auricle appeared as a long, smooth, fleshy lobulus. The external meatus was closed; after pushing the auricle backward a blind sack was observed, 5 *mm* long, which was directed inward and somewhat back and upward, and was lined with epidermis. The hearing power seemed to be entirely missing, but the bone-conduction was apparently preserved; patient lacked intelligence. No other abnormal relations. An operation was not attempted. SREBERNY, Warsaw.

51. KELLER has again tried collodium, recommended by M'Keown (Belfast) for different affections of the membrana tympani, in total or partial relaxation of the drum-membrane. He instilled, after preceding air-inflation, the collodium through the ear speculum into the external auditory meatus, the patient's head being laterally inclined. The fluid in excess was imbibed by cotton. The head remained in the lateral position until the collodium had dried. The procedure had eventually to be repeated. The collodium membrane remained for three or four weeks upon the membrana tympani. The successful result of this treatment consisted in the wellnigh or entirely complete disappearance of the unpleasant sensation caused by the membrana tympani moving to and fro, and that of the painful sensations perceived in high and shrill notes. This is due, according to Keller, to the diminution of the capability of oscillation of the relaxed membrane. After the detachment of the collodium covering, the membrana tympani is stated to exhibit an increase of tension. Decrease of hearing power is frequently missing in relaxation of the membrana tympani. Keller does not mention especially whether an improvement of hearing takes place on account of the employment of collodium in cases with impaired hearing. He prefers this method to others, which are mostly more severe. KILLIAN.

52. WARD COUSINS reports great satisfaction with his further experience in the use of his new antiseptic artificial membrana tympani. The most striking successes have been in those cases where there was a perforation and in 130 cases of this character only five or six have not been benefited more or less. The immediate improvement in hearing power is often very great.

SWAN M. BURNETT.

53. HAUG gives a brief historical synopsis of the methods of occluding perforations of the membrana tympani, and discusses the mode of action of artificial membranes and the eventual injurious consequences of aural suppurations. The author then reviews the experiments which attempt to heal the persistent opening by transplantations, principally those made by Berthold, Ely, Tangemann, and he reports two transplantations which he has performed. At the conclusion he mentions the use of the egg-shell membrane.

54. BARCLAY relates the histories of nine cases of perforation of the membrana tympani, some of them large, associated with

middle-ear disease, in which the paper disk of Blake was used with benefit. The hearing in nearly all cases was improved at once, and the perforation healed nicely.

SWAN M. BURNETT.

55. (1) Perilous bleeding in paracentesis of the membrana tympani through injury to the bulbus venæ jugularis. In front of the paracentesis there appeared a marked blue coloring of the posterior, lower quadrant of the membrana tympani; in the anterior portion the boundary of the exudation was pronounced by a yellow line. Dilatation of the incision to the lower margin of the membrana tympani. Intense bleeding stopped by plugging. Recovery without reaction. (2.) Rupture of membrana tympani caused by lightning. A day after the injury the patient noticed considerable bilateral hardness of hearing. There was found on examination of the right ear a perforation, of about the size of a pea and of the shape of a kidney, in the posterior segment, with the margins turned inward, which LUDEWIG considers as a primary rupture caused by lightning. RUMLER.

[*To be concluded in the next number.*]

MISCELLANEOUS NOTES AND NEWS.

SOCIETY MEETINGS.

WEST KENT MEDICO-CHIRUGICAL SOCIETY, Nov. 11, 1890.—Mr. Mark Hovel read a paper on "Adenoid Growths in the Naso-Pharynx." He pointed out that the three chief symptoms were (1) dulness of expression, (2) open mouth, (3) snoring; occasionally conjunctivitis and other ophthalmic disorders were induced. In operating, he prefers the forceps and objects to scraping.

BRITISH MEDICAL ASSOCIATION.—*South Wales and Monmouthshire Branch.*—At a meeting held at Abergavenny in November, Dr. Paterson, of Cardiff, read a paper on "Post-Nasal Growths in Relation to Throat and Ear Disease."

HUNTERIAN SOCIETY.—At the meeting of this society on November 26th, Mr. G. H. Jackson recorded a case of tinnitus induced by a small fragment of iron which had been blown into the ear.

CLINICAL SOCIETY OF MANCHESTER.—At a meeting held on December 16th, Dr. Mulligan and Mr. Herbert Lund showed a case in which the mastoid antrum had been opened for acute catarrh of the tympanum secondary to influenza. About a drachm of pus was evacuated, and the healing was completed in three weeks. Mr. Lund suggested the advisability of opening the antrum in all chronic cases, so as to limit the risk of subsequent brain infection.

APPOINTMENTS.

G. L. CHEATLE, F. R. C. S., Clinical Assistant to the Royal Ear Hospital, London.

DR. GRADENIGO, Professor of Otology in the University of Turin.

DR. E. MADDOX, Ophthalmic Surgeon to the Edinburgh Deaf and Dumb Institution.

DR. E. HORSLEY, Aural Surgeon to the Edinburgh Deaf and Dumb Institution.

H. SECKER-WALKER, F. R. C. S., Assistant Ophthalmic and Aural Surgeon to the Leeds General Infirmary.

R. HERRICK, M.B., Assistant Surgeon to the Nottingham Throat and Ear Hospital.

DR. B. A. RANDALL, a graduate of the University of Pennsylvania in 1880, has been appointed Clinical Professor of Otology in the University, to succeed Dr. Geo. Strawbridge, resigned. The choice is excellent.

BEQUEST.

By his will, the late Mr. H. J. Hunt, of Brexlow Hill, has left the sum of £200 to the Asylum for the Deaf and Dumb, Old Kent Road.

MISCELLANEOUS.

The Committee of Management of the **National Eye and Ear Infirmary of Dublin** propose to increase the accommodation at that institution, and to provide beds for sixty in-patients ; for this purpose the sum of £7,000 is required.

The annual meeting of the governors and others interested in the **Newcastle Throat and Ear Hospital** was held on January 23d. It transpired that 2,516 patients had passed through the institution.

The bill to provide for the **elementary education of the blind and deaf in England** was read a second time in the House of Lords on February 16th, and passed through committee and was reported on February 23d. A somewhat similar measure, applying to Scotland only, was passed last year, and when the English bill has passed through all its stages we hope to be able to give a *résumé* of the two together.

In connection with the **London Post-Graduate Course,** the following (among other) lectures have been delivered since the beginning of the year, viz. :

By Mr. W. R. H. Stewart, at the London Throat Hospital, "On Otorrhœa."

By Dr. Ed. Woakes, "On Tinnitus and Vertigo."

By Mr. G. Stoker, "On Chronic Glandular Disease of the Pharynx and Naso-Pharynx," and "On the More Common Forms of Disease of the Nose."

We are glad to see that the importance of Otology has thus received practical recognition in this course, though it still remains unnoticed in the prospectus.

In a recent number of the *Lancet* (February 28th), Mr. Mayo Collier records a case in which the little operation of **"Tapping the Mastoid Cells"** was resorted to rather as a matter of precaution than cure. In his own words: "I would urge that, although there be no pain or tenderness and no evidence of the retention of pus, if the discharge be obstinate, offensive, and of some years' standing, a cure may be effected and death everted by a timely vent in the mastoid process." With this advice there are, we should imagine, but few who will not agree.

The annual general meeting of the **Royal Ear Hospital of London** was held at the hospital, Frith Street, Soho, on January 20th. The report for the previous year (1890) was presented, and showed a decided increase in the number of patients that had been under treatment. One hundred and thirteen cases had been admitted as in-patients, of which no less than 95 were under the age of sixteen; the out-patients numbered 2,823. To cope with the increase in the numbers, it was thought advisable to appoint a clinical assistant, and G. S. Cheatle, Esq., F.R.C.S., was elected to that post. Considering the steady increase in the numbers from year to year, the possibility of enlarging the out-patient department was discussed. The hospital is to be congratulated upon its flourishing condition and the amount of good work it gets through.

The length of time which a **foreign body** can exist **in the external meatus** without giving rise to serious trouble, is well illustrated by a case reported in the *British Medical Journal* of February 28th, by Dr. Foxwell, of Birmingham. In this case a pea was removed, by syringing, from the meatus of a lad aged eighteen, in whom the symptoms of earache, etc., had only lasted six weeks, while an authentic history of the introduction of the pea two years and one half previously was given.

Obituary.

1. When requested by the editor of these ARCHIVES to write an obituary of the late Dr. **Henry Ferrer,** I thanked him for the privilege accorded me of testifying my esteem for a *confrère* who had resided and practised for many years in the same city with me. Ferrer was born at Santiago de Cuba in 1850, and died at Santa Barbara, California, October 22, 1890.

Santiago de Cuba, Bordeaux, and Heidelberg were three essential factors in framing his body and mind. Sunny France deepened the warmth and glow of his temperament, and added "grace and form to the clear-cut Spanish mould." Naturally dexterous and quick, as he ripened intomanhood, studious habits and an ideal love for the study of medicine, in Alt Heidelberg, took full possession of him. He was the right man for the city at the Golden Gate.

The Spanish, French, German, and English languages were equally at his command, and he spoke himself into the confidence of his cosmopolitan clients. His own countrymen were proud of him, the French loved him, the Germans fraternized with him, and the Anglo-Saxons fully esteemed him. But above all this was the fact that his *confrères* did not grudge him his success, for they could not but admit his skill as a diagnostician and operator, and admire his industry, his fairness, and his great desire to improve every branch of his profession. He was a competent pathologist and microscopist, and a very clever draughtsman, and in fact was the main support of the German Hospital.

He took an active part in the medical societies of San Francisco, and communicated his experience and investigations in numerous contributions to medical journals, of which the recent articles on operations on the mastoid process in the ARCHIVES OF OTOLOGY are of particular importance. His early death will be regretted, and his memory kept in honor both in America and Europe.

A. BARKAN.

2. At the comparatively early age of forty-nine, **Edward Bellamy,** F.R.C. S., etc., Senior Surgeon to Charing Cross Hospital, fell a victim to the severe weather which prevailed in London during December and January. He died of acute pneumonia on January 4, 1891. It will be within the recollection of many that he was the author of the article on "Diseases of the Nose," in Quain's Dictionary of Medicine.